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The Editor's notes are marked (*Ed.*).

ABSTRACTS

AGRICULTURAL INTELLIGENC.

GENERAL INFORMATION.

9 - Decree of the Minister for Agriculture Creating a Service of Agricultural Material in France. — *Journal Officiel de la République Française*, Year 59, No. 281, p. 9166, Paris, October 16, 1917.

Under date of October 15, 1917, the French Minister for Agriculture published the following decree:

Art. 1. — A Service of agricultural material is instituted at the Ministry Agriculture (Direction of Agriculture, Office for agricultural informa-

Art. 2. — This Service has the function of providing material, parti larly machinery, instruments and products required for agriculture.

It promotes the formation of industrial, commercial and agricultural ngings to facilitate production, exportation, distribution, sale and pur- se and puts these associations into connection with manufacturers and lustrial and commercial associations.

It provides for a just distribution of metals between makers and con ls the prices, so as to avoid large increases.

Art. 3. — The head of the office for agricultural information, sent by e Minister of Agriculture as delegate to the Commission for metals and manufactures, directs the Service for agricultural materials. He signs correspondence of the Service and gives endorsements and permits. questions prepared by the Service, which should be approved by the nister, are signed by him and presented to the Director of Agriculture.

Art. 4. — The Director of Agriculture is responsible for carrying out s decree.

11 - Laws and Orders concerning the Production, Preservation and Sale of Milk and Cream, in the United States. — See No. 1128 of this *Review*.

1112 - **Agricultural Development in South Africa.** — In *The Board of Trade Jou* Vol. XLVIII, No. 1086, pp. 627-630. London, September 20, 1917.

In his Report for 1916 the General Manager of Railways and Harbo in South Africa states that the past year was notable for the extensive velopment of agricultural and other industries in South Africa.

AGRICULTURE. — Experiments in the cultivation of *sugar beet* are be conducted in the Oudtshoorn district, and a movement is on foot to increa the area of its cultivation and to ascertain by trial whether the beets v thrive in the fertile localities of the Karroo. The yield of sugar from be is stated to have been satisfactory.

During 1916 important developments took place in the *frozen m industry*. Cold storage and chilling facilities are being increased at Pr ria, Bloemfontein, Maritzburg, and Durban, and the Railways and Harb Administration is co-operating in arrangements for an export trade. nicipalities are extending and improving their abattoir facilities.

There have been marked developments in the *creamery* and *dairy b* ness; twelve creameries and fourteen cheese factories have been es lished in the Union since the outbreak of the war.

One result of the difficulty in obtaining space for exports of *fresh fr* has been the production of larger quantities of *dried fruit*. Large tinni drying and jam factories have been established. About 20 000 tons of fr of which 4 000 tons were exported, were made at Paarl and Wellington d ing the year.

The 1916 *tobacco* crop in the Rustenburg district was large and of b ter quality than that of the previous year. An effort is being made to velop an export trade from this district, and farmers propose to cultiv the plant on a more extensive scale.

FORESTRY. — The shortage of tonnage and the difficulty of procur supplies of imported timber have led to a noticeable development in the cal *timber industry*. Since the war commenced, South African timbers h replaced imported wood formerly used for many purposes in the mines. are also being extensively used for wagon building, furniture, box mak floor boards, and other building purposes.

Boxwood is now being exported in considerable quantities, and but the shortage of tonnage this trade would have greatly developed

Two *match factories* are using local woods exclusively for their produ *Fruit boxes*, which were formerly imported in large quantities, are now b manufactured in South Africa.

The *wattle bark industry* has made rapid progress in recent years. as a result of the war, an allied industry, namely, the preparation of w extract, has been established. Factories for the preparation of the ext have been erected at Maritzburg and Merebank in Natal. Altoge about 500 tons of extract were exported during 1916.

In addition to exports of bark to the United Kingdom, India, Au lia and the United States, where the demand for wattle bark is increa a new market has been opened up in Russia and Japan, 7286 tons of having been exported to the former country in 1916, and 690 tons to

latter. In order to economise ships' space, an experiment has been made with pressing and baling the bark, and the result was satisfactory.

The *manufacture of tannin* in South Africa has aided the work of the numerous large *tanneries* in the Transvaal, Natal and Cape Province, which are showing signs of progressive development. Three boot factories in the vicinity of Cape Town and boot and shoe factories at Great Brak and Port Elizabeth are working on an extended scale. In a large tannery and boot factory established at Pretoria since the war all the material used for tanning hides are of local manufacture. A tannery has also been established at Zandfontein.

FERTILISERS. — *Sheep-dip* and *nitrate of soda* for fertilising purposes — both new industries in South Africa — are being despatched in considerable quantities from works at Firgrove.

Large works for the manufacture of ammonia have been erected near Pretoria, the principal product at present being *sulphate of ammonia*.

Quite substantial industries for the supply of *fertilisers* have been started at various centres.

33 - Studies of Food Utilisation: the Utilisation of Carbohydrate on Relatively High and Relatively Low Cereal Diets. — ZENTMIRE, ZELMA and FOWLER, CHESTER C., in the *Journal of Biological Chemistry*, Vol. XXXII, No. 1, pp. 77-85, bibliography of 15 publications. Baltimore, October 1917.

This study was carried out at the Laboratory of Physiological Chemistry of the Iowa State College, in order to ascertain how much, if any, difference occurs in the utilisation by the organism of cereal protein and cereal carbohydrate when ingested in varying amounts in the form of thoroughly cooked cream of wheat ". The article analysed gives the results relating to the carbohydrates.

The experiment lasted 3 weeks, divided as follows: 5 days of lower cereal diet; 5 days of higher cereal diet; 2 days each of nitrogen-free diet, and higher starch diets; preliminary and intermediate periods of 3 days each in which a simple mixed diet was ingested. To the cream of wheat and the starch pudding were added only small quantities of milk, sugar and butter.

The cereal and starch were boiled a few minutes on the stove, then placed in a large fireless cooker overnight.

In all cases the lower diet was equal to half the higher diet.

The results obtained led to the following conclusions:

1) The utilization of total carbohydrates of a diet consisting largely of cereal is above 99 per cent.

2) The carboydrate is as completely utilised with one quantity as another of cereal in the diet, even when the cereal is taken in larger amounts than are found in the average dietary.

3) Monotony and unpalatability of diet have little or no effect upon the ultimate utilisation.

CROPS AND CULTIVATION.

1114 – **Relation of the Water-Retaining Capacity of a Soil to Its Hygroscopic Coefficient.** — ALWAY, F. J. (Chief of Division of Soils), and MCDOLE, G. R. (Assistant Soils, Agricultural Experiment Station, University of Minnesota), in the *Journal of Agricultural Research*, Vol. IX, No. 2, pp. 27-71, fig. 4, bibliography of 25 publications Washington, 1917.

In recent years, the importance of the water contained in the deep portions of the subsoil — that below the depth penetrated by the roots crop plants — has been a much discussed question regarding which opinic is much divided. The present differences in view, according to the writer appear to be due to the failure (in laboratory experiments and field studie to take into consideration some physical constant that is directly relat to the lower limit of available moisture (which practically coincides wi the hygroscopic coefficient) and the maximum water-retaining capaci of the soil.

After reviewing previous work on this subject, the writers describe periments carried out with uniform columns of soil of known hygrosco coefficient and moisture equivalent (1) and known maximum water ca city and nitrogen content, for the purpose of ascertaining the movem of water in the soil under different conditions. The 13 soils (soils and s soils) used, ranged in texture from a coarse sand to a silt loam with hygr copic coefficients of 0.6 and 13.3 respectively.

Five of the loams placed in capillary connection with the natural s soil mass and allowed to stand protected from surface evaporation for s months, lost water until the amount retained bore a close relation to the groscopic coefficient, being from 2.1 to 3.1 times this value, accordin the particular soil. When, however, a layer of coarse sand or gravel se ated the column of loam from the subsoil, the downward movement of water in the soil above this layer was much delayed. Where the col consisted of successive 2-inch layers of loam differing widely in text the order of their arrangement exerted no influence upon their final w content.

Soil columns 30 to 36 inches long, while protected from all loss of m ture at the sides and bottom, were freely exposed to evaporation at surface for periods varying from 3 weeks to 6 months. The moisture tent, originally uniform and lying between 2.0 and 3.0 times the hygrosc coefficient, fell until it reached, at depths below the first foot, an alr constant minimum with the ratio 1.9 to 2.2.

Employing 2-foot columns of 12 different loams, each with an in moisture content approximately equal to its hygroscopic coefficient, en water was added to raise the average moisture content of the column t times the hygroscopic coefficient. After the cylinders had stood 3

(1) The moisture equivalent represents the capacity of capillary water. For this as well as the preceding and following terms, see *B.* 1012, No. 9[illegible].

onths fully protected from evaporation, the distribution of moisture with gard to the surface to which it had been applied was found to be the same both experiments. The maximum final ratio of $\frac{\text{moisture equivalent}}{\text{hygroscopic coefficient}}$ was und 3 inches from the surface of application with values ranging from 7 to 2.4. This ratio, however, is not the same for all the soils that have e same hygroscopic coefficient The water-retaining capacity of loams, determined by laboratory experiments, was found to bear a somewhat ser relation to the moisture equivalent than to the hygroscopic coefficient.

Coarse sands exhibited a behaviour very different from that of the ms, for 3 months after 1 inch of water had been applied to the surface, e ratio of $\frac{\text{moisture equivalent}}{\text{hygroscopic coefficient}}$ was as high as 6.0 or 7.0 at 6 inches from e surface, while in the second foot it was only 1.0. These results were nfirmed by field studies. Fine sands occupy an intermediate position tween the loams and the coarse sands.

Field studies also show that when loams, after rains sufficiently heavy moisten them thoroughly, are protected from loss by evaporation d transpiration they lose water by downward movement until the tio of $\frac{\text{moisture equivalent}}{\text{hygroscopic coefficient}}$ lies between 1.8 and about 2.5, and accordgly on the uplands of dry-land regions, this is the ratio to be expected the deeper sub-soil — the portion below the range of plant roots.

A comparatively abrupt transition from the moistened soil to the thoughly exhausted underlying layers, with ratios of 2: 2.5 and 1.0: 1.1 spectively, is found even several months after liberal rains have fallen.

It is clear that the moisture of the deeper sub-soil will be able to move ward only so slowly and through such a short distance in a single season, at it will be at most of no practical benefit to annual crops, and the only y to make use of this moisture is to follow such crops at intervals by deepoting perennials.

Further experiments, however, of a long-time character are necessary decide definitely whether the deep sub-soil may not in a decade or so conbute sufficient moisture to the subsoil within the reach of such perennials, to 30 ft., to make such a contribution of some practical importance for ch crops.

15 – On the Supposed Relative Unilateral Impoverishment of the Soil in Nitrogen, Phosphoric Acid and Potassium by Various Crops; Action of the Root System of the Plants.

— Модестовъ А. (Modestov, A.), in *Земледѣльческая Газета* (*Agricultural Gazette*), No. 8 (176), pp. 174-176. Petrograd, February 25, 1917.

It is generally admitted that various crops impoverish the soil in nitro-n, phosphoric acid and potassium in various proportions. This has led distinctions' being made in this respect between different groups of plants; example, cereals are considered particularly exacting in nitrogen and osphoric acid, whereas tubers demand much potassium, etc. These conerations are included in the principles of crop rotation.

The author acknowledges that the various cultivated plants extract

fertilising elements from the soil in different proportions, but, on the bas of calculations concerning the average yields of the various crops (whea oats, beet, potato, buckwheat, clover, etc.), he concludes that the to quantities of nitrogen and phosphoric acid extracted from the soil by the plants are *almost equal*, so that it is not possible to admit a relative unil teral impoverishment in these two elements by the different crops. On th other hand, there are differences in the total quantities of *potassium* e tracted by the crops.

These conclusions, based on elementary calculations, clash with t present theory of crop-rotation.

How then is it possible to explain the fact that, with crop rotation, given plant, wheat for example, gives higher yields than with continuo cropping? Thus, in the experimental fields at Poltawa (Russia), whe following after wheat yielded 8 ¼ cwt. per acre, whereas, following plants which extract the same quantity of nitrogen and phosphoric acid, yielded from 9 ½ to 11 cwt. of grain per acre. The potassium has not bee taken into consideration, because wheat requires but little, and it w precisely after crops demanding much potassium (beets, potato buckwheat, etc.) that it gave the highest yields. In this case it is impo sible to talk of a *minimum* of potassium resulting from a relative unilater impoverishment. It is clear that here the rotation of the crops has i importance.

If indeed this increased yield of wheat does not depend on rotati (in the sense either of a relative unilateral impoverishment or enrichmen what is the probable cause of the decreased yields given by continuous cro ping of the same plant and the increased yields obtained by rotation? T author believes it may be accounted for by the following causes:

1) *Total quantity of moisture extracted from the soil by various crops.* must be noted that root crops, which extract 1.6 times more moisture fr the soil than wheat, cannot, in this respect, have any beneficial influence the following wheat crop, rather they will have deprived it of water in a vance.

2) *Physical condition of the soil.* This is more favourable to nitrifi tion and the accumulation of moisture in the case of hoed crops than that of wheat. It is to the better physical condition in which hoed pla leave the soil that their beneficial influence on the following crops must attributed rather than to the different requirements of the crops in fe lising elements.

3) *Differences in the root system of the plants cultivated.* If, for exam beets and oats are compared from this point of view, there is reason to lieve that the point of contact of the roots with the soil particles dif in the two plants. On the other hand, the principal parts of the root oats and beets develop in different layers of the soil. The author belie this difference in the position of the root system of the plants grown is real cause of the favourable action of crop rotation.

Attention is also drawn to the different dissolving capacity of r of various plants and to DE CANDOLLE'S theory of poisoning of the

Finally the author points out the necessity of examining the prevailing theory of soil "fatigue", which attributes this fatigue to a relative unilateral impoverishment of the soil in nitrogen, phosphoric acid and potassium in plants which are cropped continuously, for, as has been seen, this impoverishment cannot be sufficiently great to be of practical importance.

116 – **The Effect of Soil Reaction on the Availability of Ammonium Sulphate.** — Cook, R. C. and Allison, F. E. (Rutgers College), in *Soil Science*, Vol. III, No. 6, pp. 487-498, fig. 2. New Brunswick, N. Y., 1917.

Experimental researches on the effects of applying increasing amounts of lime to 3 types of soil: sand, sandy loam and silt loam. These soils had respectively a calcium oxide (Ca O) requirement of 3000 lbs., 3000 lbs. and 6000 lbs. per acre. These effects were studied in connection with the application of varied amounts of ammonium sulphate to pot cultures of buckwheat. All the pots received an excess of potassium and phosphorus, and the soil was made up to optimum moisture content.

With small applications of calcium oxide, practically as large yields of buckwheat were obtained as where enough lime was added to neutralise all the acidity, or make the soil distintly alkaline. The beneficial effects of calcium oxide on acid soils were much more noticeable on the sandy soils than on the silt loam. Buckwheat grown on the more acid soils usually showed a higher nitrogen content, but the total yield of the crop was smaller. For this reason, the recovery of the nitrogen from the more acid soils in many cases was as great as, or even greater, than from the alkaline soils. Further, the addition of calcium oxide to acid soils allows the soil nitrogen to be made available to such an extent as to supply the needs of the crop. Hence the use of ammonium sulphate on alkaline soils may produce a smaller increase in yield than where the same amount is added to an acid soil. Buckwheat is able to use the nitrogen from ammonium sulphate at an acidity of 3000 lbs., or 4000 lbs. of calcium oxide per acre. This nitrogen is either taken up as ammonia, or else nitrification proceeds to a considerable extent in the presence of the acid. The yield of dry matter on the acid soils is low, not because of lack of available nitrogen, phosphorus, or potassium, but probably on account of the unfavourable medium in which the plants must grow.

117 – **Livestock and the Maintenance of Organic Matter in the Soil.** — Eppis, E. O. in the *Journal of the American Society of Agronomy*, Vol. 9, No. 3, pp. 97-105, fig. 1. Lancaster, Pa., 1917.

Since organic matter in the soil is universally recognised as necessary to its maximum productiveness and the maintenance of organic matter constitutes one of the most difficult problems of practical farming, the writer has desired in his paper: 1) to lay more stress upon the importance of the organic constituents than is generally done: 2) to direct attention to the fact that the effect of animals upon their feed has not been emphasised in the ordinary discussion of soil maintenance and animal husbandry.

The most important conclusion drawn by the writer is, that the higher plants are able to use organised carbonaceous foods, both nitrogenous and non-nitrogenous; these foods conserve energy in the process of growth of the

crop and make possible a larger total growth in a given time. The organ matter in the soil is the direct source of the carbonaceous material used the plant ; therefore any process that permits the destruction of organic ma ter that might find its way into soil is likely to be poor economy. Anima destroy from 50 to 90 per cent. of the organic matter in the feed consume It is burnt up in the body processes and expended as energy : a further lar loss occurs in the handling of the manure. It is impossible to maintain t organic matter in the soil without animal husbandry. On very poor soil stock-keeping may be bad practice, but it may be justified by large profi from the animal products by means of which the loss of organic matter c be made up from other sources.

1118 – **Soil Constituents Which Inhibit the Action of Plant Toxins.** — TRUOG, E. (Chemist) and SYKORA J. (Department of Soils, College of Agriculture, University of W consin), in *Soil Science*, Vol. III, No. 4, pp. 333-352, bibliography of 18 publications, plates. New Brunswick, N. Y., April, 1917.

The writers apply the term plant toxins to those substances which, concentrations considerably below the osmotic equivalent of the cell sa are injurious to living plant protoplasm. This definition includes both in ganic and organic compounds, which may be acidic, basic or neutral character.

It seems that there are certain soil constituents which inhibit t action of plant toxins. In order to ascertain whether this inhibitory acti was mainly due to physical factors (adsorption) or chemical factors or bo the writer first carried out a series of pot cultures of wheat where the p *sical* conditions depended upon the materials used in the preparation the artificial soil : 1) pure quartz sand : 2) quartz sand + quartz flo 3) quartz sand + kaolin ; 4) quartz sand + superior red clay. The *che cal* conditions, however, depended on the presence, or absence, of calci carbonate. The cultures were grown in the necessary nutrient solutio to which were added the toxic substances experimented with. The lowing facts were recorded by the writer :

Copper Sulphate and Copper Nitrate. - The toxic action of copper phate was slightly decreased when the surface of the artificial soil pa cles was increased by the addition of quartz flour or kaolin, but this be ficial effect was very small as compared with that exercised by calc carbonate, which completely destroyed the toxic action both of cop sulphate and copper nitrate.

Sodium Arsenite. -- The toxic action of sodium arsenite was redu by the addition of quartz flour to the sand in the pots ; on the other h the addition of kaolin did not give this good result. It therefore s probable that, in the first case, the beneficial effect was not due to the sical condition of the quartz flour, but to certain impurities known t present in quartz flour, and which acted as catalytic agents in the dation of sodium arsenite. Calcium carbonate had practically no e in reducing the toxic action of sodium arsenite.

Guanidine Carbonate. — In this case, on the contrary, the pres of kaolin in the soil of the pots had a beneficial effect, inhibiting the

tion of the guanidine carbonate and thus promoting the development of e wheat; while quartz sand had no effect, and calcium carbonate was ac-ally injurious. The beneficial effect of kaolin may be attributed to its d nature, which allows of its combining with guanidine in such a manner to render the latter inactive. This would explain the behaviour of the cium carbonate (not acid) and would be confirmed by another experi-nt in which the kaolin was replaced by distinctly acid red clay.

The writers afterwards made a series of pot experiments with 2 *natural* ls, both acid: 1) infertile acid sand; 2) fertile silt loam. This time y used vanillin as the toxic agent. Vanillin proved distinctly toxic on poor, sandy soil where neither nutrients nor limestone were added, reas it had no toxic effect on plants grown in the fertile silt loam.

From all the results obtained, the writers conclude that, in the amelio-ion of toxicity in soils, *chemical* reactions play as important a part as *sical* phenomena (such as adsorption), and possibly the former have the ater effect.

9— **The Soils of Hawaii.** — BURGESS, P. S., in *Report of Work of the Experiment Station of the Hawaiian Sugar Planters' Association, Bulletin* No. 15 (Agricultural and Chemical Series), pp. 100. Honolulu, Hawaii, 1917.

This Bulletin opens with a general account of the formation, physical, mical and biological properties of the soil, after which the soils of the dwich Islands, and those of Hawaii in particular, are discussed. The waiian soils are of particular interest, being of volcanic origin and situated der very varying climatic conditions. They are chiefly laterites, with ery high content of iron, aluminium and the alkaline earths, but with w silica content. Due to pre-existing tropical verdure, most of the soils ntain large amounts of humus and nitrogen. The total phosphoric acid l *soluble* silica are also usually high. The following table gives the re-ts of a number of analyses (by the strong acid digestion method) of Ha-iian soils, a number of analyses of American soils being included for com-rison.

mparative Percentage Composition of American and Hawaiian Soils.

	Total SiO_2	Soluble SiO_2	K_2O	Na_2O	CaO	MgO	Mn_3O_4	FeO + Fe_2O_3	Al_2O_3	P_2O_5	SO_3	N
rican Soils	85.52	6.40	0.40	0.2	0.75	0.68	0.12	3.81	5.15	0.10	0.04	0.18
an Soils	32.63	17.50	0.34	0.35	1.30	1.18	0.50	28.02	20.72	0.35	0.32	0.33

The rainfall varies considerably, arid conditions prevailing in certain as, while over a large part of the uplands and on the windward side the nfall is excessive (200 to 300 inches per annum in certain districts).

Physically the soils of Hawaii are unique. They can mostly be class-as high humus clay and silty clay loams, although the amounts of

true clay (hydrated aluminium silicates) in all cases are very low or n Colloidal aluminium and iron hydrated oxides give to the soils their appa ent clayey characteristics. The soil moisture conditions are discuss fully, the moisture coefficients being shown to be abnormally high. T hygroscopic coefficients vary from 9 to over 26 per cent. (determined HILGARD'S standard method), while the optimum moisture capacity ave ages about 45 per cent. of the dry weight of the soils. The "free water varies from 15 to 38 per cent. while the maximum water holding capaci is well above the average of ordinary soils. The soils do not usually ca badly unless very puddled, and under good conditions give a good tilth

The writer then gives an account of his physical, chemical and b teriological studies of the soil, together with such practical interpretatio as may be useful to the agriculturists of Hawaii. As regards the bacter logical work, soil nitrification was thoroughly studied. Forms of the nitr gen-fixing *Azotobacter* were found to be well distributed.

The bulletin closes with a discussion of the analytical and oth methods employed in the course of the work.

1120 – **Variations in the Chemical Composition of Soils in the United States.** RO INSON, W. O., STEINKOENIG, L. A. and TRY, W. H. (Scientists in Chemical Inve tig tions), in *United States Department of Agriculture, Bulletin* No. 515, *Contribution from Bureau of Soils*. Washington, 1917.

Determinations of the chief constituents in 45 samples of 18 typic soils of the United States ranging from sands to clays.

The writer confirms the previous observations according to which distinct difference in texture and colour between soil and sub-soil is general accompanied by a no less well-defined difference in the chemical compo tion, especially as regards the amount of silica, iron and alumina prese Thus, samples of soil and subsoil taken from 35 localities show that the substances are more plentiful in the subsoil than the soil :

for *silica*	in all cases investigated, except	2
for *iron*	» » »	5
for *alumina*	» » »	1

The soils analysed were so different as regards : nature of original m terials ; mode of formation ; topographical conditions ; climatic conditio that probably they give for some constituents almost the extremes of t composition of the soils of the United States. These extremes would b

Silica	44.15	97.01
Iron	0.33 —	16.23
Alumina	1.16 —	27.58
Potassium	0.02 —	4.07
Sodium	0.01 —	2.06
Calcium	0.01 —	1.71
Magnesium	0.01 —	1.93
Phosphoric acid	0.03 —	0.22
Sulphurous acid	0.02 —	0.14

Some soils of the same type may differ considerably as to their chemical composition. On the other hand, certain soils belonging to different types can have as similar a chemical composition as the various samples of the same type. As regards the limits of analytic error (0.10 per cent. for calcium — 0.05 per cent. for potassium — 0.05 per cent. for phosphoric acid), it must be remarked that differences of hundreds of pounds due to this source are not of great practical importance in giving the constituents of a soil in lbs. per acre for a layer 6 in. in depth.

21 - Studies on Soil Colloids in the United States. — I. WOLKOFF, M. I. (Michigan Agricultural College), Flocculation of Soil Colloidal Solutions, in *Soil Science*, Vol. I, No. 6, pp. 585-601, fig. 3, bibliography of 43 publications. New Brunswick, N. J., 1916. II. IDEM, Influence of Colloids on Electrical Conductivity of Salts, Vol. III, No. 5, pp. 423-430, fig. 2, tables III, bibliography of 9 publications. New Brunswick, 1917.

I. — The present state of our knowledge of flocculation of soil particles is based largely upon 3 sources of information, namely: 1) deductions from general colloidal chemistry, 2) studies with kaolin, and 3) studies with different clays.

The writer is of opinion that the study of the colloidal solutions of different soils is the best method of understanding the phenomenon of flocculation in soil. He investigated 7 types of soil, including kaolin, and 67 electrolytes. The chief results of his researches were as follows:

1) The flocculating power of different electrolytes varies for the same colloidal solution.

2) The flocculating efficiency of the same electrolyte varies considerably according to the colloidal solutions from different soils, for it largely depends upon their chemical composition.

3) SCHULZE's valency law does not hold true with the soil colloidal solutions studied, since the humic substances present hinder the coagulating power of the electrolytes.

4) It takes a greater amount of electrolyte for flocculation of a more concentrated soil colloidal solution than that for a less concentrated one. Thus in the flocculation of the soil colloidal solutions by the electrolyte, the reaction obeys, within the experimental error, the law of mass action.

II. — In the second series of experiments, the writer used colloidal solutions obtained from a clay nearly devoid of organic matter; thus the colloidal solutions were *mineral* solutions. He was able to make the following observations:

1) The inorganic colloidal particles, as found in clay, especially the colloidal gels, hinder the electric conductivity of salt solutions, especially at the moment of complete coagulation.

2) The causes for such an interference lie possibly in *a*) the fact that colloidal particles moving comparatively slowly are in the pathway of the free ions, and *b*) that the change of the structure of the gel at the point of coagulation results in an increase in the adsorptive capacity of colloids.

3) The adsorption of electrolytes by the gel increases with the increase of the electrolyte present for coagulation.

4) The coagulation of the colloid solutions by means of certain elec-

trolytes can be employed for separation of colloids from crystalloids, pr
vided that only a minimum amount of electrolyte be used for a compl
coagulation in order to reduce to the minimum the error due to adsorpti

1122 – **On the Physiology and Biology of Nitrogen-Fixing Bacteria.** – OMELIANS
V. L., in the *Archives des sciences biologiques de Pétrograd*, Vol. XIX, No. 3, pp. 205-
1916; summary by SAZERAC, R., in the *Bulletin de l'Institut Pasteur*, Vol. XV, No. 5, pp.
134. Paris, 1917 (1).

The writer is contrary to the general opinion, according to which (
stridium pasteurianum is considered of less practical importance than *A*
tobacter as regards nitrogen-fixation. The above paper contains a crit
discussion of the most important and recent work on *Clostridium*, cert
new experiments being added to complete the knowledge of certain in
esting facts relating to the biology and physiology of that organism.

In relation to the *optimum* temperature the writer notes that growt
is more abundant and the fermentation of sugar more energetic at abo
30° C, but nitrogen-fixation is less than at the ordinary temperatu
Clostridium may be heated to 75° C without destruction; other non-spori
species can, therefore, be eliminated by prolonged pasteurisation at th
temperature. Spores of *Clostridium*, preserved in the dry state in air f
20 years, gave vigorous cultures that had not lost their power of nitrog
fixation.

With cultures in the presence of carbohydrates, the fermentation
10 carbohydrates (dextrose, laevulose, saccharose, galactose, maltose, r
finose, dextrin, inulin, glycerin, mannite) was observed, while WINOGR
SKY had only observed the fermentation of 3. The most vigorous grow
took place in media containing dextrose, raffinose, inulin and mannite. T
concentration of the sugar has a great influence on the nitrogen-fixation
Clostridium, as is the case with *Azotobacter*; the greater the concentrat
the less the nitrogen fixation per gram of sugar.

The manner in which the nitrogenous food is supplied has effect
nitrogen-fixation. Too large an increase in nitrogen-content of the medi
decreases fixation, finally stopping it. Nevertheless, with a *Clostridi*
from Volhynie, isolated by the writer, nitrogen fixation still took place wh
the nitrogen and sugar of the medium were in the ratio as 16 : 1000, wher
fixation was stopped when the ratio was as 6 : 1000, according to WI
GRADSKY.

The Author strongly upholds WINOGRADSKY's opinion, that consi
Clostridium as a typical butyric ferment, and he has found that the po
of fixing nitrogen is very general in the group of butyric bacteria.

1123 – **New Method for the Estimation of "Zeolitic" Silicic Acids in Soils**
ГЕДРОЙЦЪ Г. (GEDROITZ, G.), in *Журналъ Опытной Агрономіи имени* П
КОССОВИЧА (*Review of Experimental Agronomy dedicated to the memory of* P. S. Ko
VITCH), Vol. XVII, No. 5, pp. 500-[illegible] (with summary in French). Petrograd, 1
The estimation of the "zeolitic" silicic acid which is liberated du
the treatment of soils with concentrated, hot hydrochloric acid, is of g

(1) See *R.*, 1916, No. 731.

portance in certain deductions concerning the course of the transforma
n of soils and their formation. The method generally used in Russian
oratories for the estimation of "zeolitic" silicic acid gives thoroughly
d results, but it is fairly long, and requires the use of large platinum
hes. By VAN BEMMELEN'S method the silicic acid is not completely
erated, and there are also certain technical difficulties. The author has
rised a new method which is more rapid, does not require the use of
ge platinum dishes and gives equally satisfactory results.

Five grammes of soil are heated after having been treated with 10 % hy-
chloric acid. For this purpose small platinum dishes are used and a
s burner with a movable top bored with holes. The temperature must
t exceed 62.5° C. After complete destruction of the organic matter and
oling, the burnt soil is put into a beaker, to which is added water and
0 cc. of 5 % caustic potash solution. The liquid is stirred, heated over
e water-bath for ½ hour, and then filtered; as the first part of the liquid
always rather thick, it is re-filtered. The contents of the funnel are
shed 10 times with a dilute solution of caustic potash (1 %). The
ered liquid, acidified with hydrochloric acid, is evaporated and dried
1 to 1 ½ hours over a sand-bath at 125 to 150° C. The silicic acid, now
mpletely insoluble, may be isolated by filtering, after being washed very
oroughly, so as to leave no trace of chlorine.

24 - **Irrigation Technique for Sugar-Beets, in Utah, U. S. A.** — See No. 1157 of this *Review*.

25 - **Irrigation and Manuring Studies; The Effect of Varying Quantities of Irrigation Water and Manure on the Growth and Yield of Corn.** — HARRIS F. S. and PITTMAN, D. W., in *Utah Agricultural College Experiment Station, Bulletin* No. 154, pp. 29, figs. 11. Logan, Utah, April, 1917.

This bulletin reports the results of an experiment on the irrigation and manuring of corn for the six years from 1911 to 1916 inclusive (1).

The highest yield of grain was obtained with 20 inches of water and e highest yield of stover with 30 inches. Where as much as 40 inches of ter was applied, the yield of crop was decidedly decreased; the extra ter was not only wasted but the time used in applying it was lost and the tility of the land injured. The value of an acre-inch of water was found to about as follows when different quantities were applied: For 5 inches, 90; for 10 inches, 87 cents; for 20 inches, 69 cents; for 30 inches, 42 nts; and for 40 inches, 24 cents for each acre-inch. Mixed horse and cow anure, when applied at the rate of 5 tons per acre, increased the value the crop by $ 3.57 for each ton of manure; and when applied at the rate 15 tons per acre, it increased the crop by $ 1.56 for each ton.

The nitrogen content of the grain was reduced by those irrigation atments that increased the yield of the crop; manure increased the per-ntage nitrogen in the grain. The phosphorus content of the grain was

(1) The first three years' results, here reported, have been published in *Utah Agricultural College Experiment Station, Bulletin*, No. 133. (Ed.)

affected irregularly by irrigation, but it was increased by manure. The cium and magnesium content of the grain was not regularly influen by the treatments.

It seems that under the conditions of the experiment, 20 acre-inche the best amount of water to use on corn. The application of as much 5 tons of manure per acre to corn each year was profitable on a clay lo soil as experimented.

Details are given regarding the effect of irrigation and manure on relative quantity and size of the various plant parts: yield of ear c shelled corn and cobs; weight of grain per bushel and of 1000 kern numberof ears and stalks per plot (7 × 24 feet); number of leaves per sta yield of stalks, leaves and husks; length of ears and leaves; widtl leaves; number of branches per tassel; nitrogen and phosphoric acid kernels.

1126 – **Comparative Value of Legumes as Green Manure.** — JOHNSON, MAXWELL THOMPSON, ALICE, R. and SAHR, C. A., in *Hawaii Agricultural Experiment Station, Honolulu, Press Bulletin* No. 52, 14 pp. 6 fig. Honolulu, February 24, 1917.

In experiments conducted by the Chemical Department of the abo mentioned Station, 32 varieties of legumes were grown on 2 soils of diff ent type: 1) dark brown Honolulu clay: 2) an acid red clay from the K nia district of the Island of Oahu. Three crops were grown of each of t varieties of legumes, using 4 pots for each trial of each variety. At ma

TABLE I. — *Approximate Content of Legume Varieties (calculated on the basis of a ton of fresh cut stems and leaves).*

Variety	Nitrogen in total plant	Nitrogen in stems and leaves	Nitrog in s
	lbs	lbs.	lb
Sunn hemp (*Crotalaria juncea*)	20.2	16.0	4
Indigo plant (*Indigofera Anil*)	28.4	20.4	8
Rattlepod (*Crotalaria Saltiana*)	23.5	15.3	8
» (*C. incana*)	18.0	15.0	3
Oregon Vetch (*Vicia americana*)	20.0	12.3	
Jack bean (*Canavalia ensiformis*)	16.3	15.0	1
Velvet bean (*Stizolobium Deeringianum*)	14.0	11.7	2
Ototan Soybean (*Soja Ototan*)	20.0	15.7	4
Partridge pea (*Cassia Chamaecrista*)	23.7	19.6	4
Cowpea (*Vigna Catjang*)	12.1	10.6	1
Hairy Vetch (*Vicia villosa*)	13.3	9.4	3
Florida beggar weed (*Desmodium tortuosum*)	19.0	15.6	3
Batchet soy bean (*Soja max*)	21.2	15.6	5
Spanish clover (*Desmodium uncinatum*)	19.8	12.8	
Sesbania aegyptiaca	11.4	7.1	4
German lupin (*Lupinus luteus*)	8.7	7.1	1
Phaseolus semierectus	17.3	13.6	3
Mung bean (*Phaseolus Mungo*)	15.5	13.8	1
Kulthi (*Dolichos biflorus*)	12.5	11.6	0
Sensitive plant (*Mimosa pudica*)	13.7	6.8	6

the plants were removed, weighed and analysed for nitrogen. Analyses he soil for nitrogen were made before planting and after removing the p. The nitrogen content was determined from the yield of freshly cut ns and leaves; the results are given in Table I.

It shows that a great deal of the nitrogen of the legumes had been ained from the air and fixed by the root nodules. These data are y approximate because: 1) They are the average of a large number of experiments which do not exactly duplicate field conditions; 2) the ount of nitrogen in a given legume varies to some extent with different ditions of soil and climate. In the writers' experiments, the crops grown poor soil were smaller than those on good soil, but the amounts of nitro- calculated on the basis of a ton of fresh-cut leaves or stems was found to ee fairly closely for both soils.

In order to compare the amounts of nitrogen added to the soil by va- us legumes, the yields of the different legumes, and also the time neces- y to mature a crop for green-manuring must be considered. Data on is subject are given in Table II. By this it is seen that *Crotalaria juncea*, *Salliana* and *C. incana* are the legumes which most increase the nitrogen ntent of the soil.

TABLE II. — *Comparative Nitrogen Adding Values of Various Legumes grown as Green Manure.*

Variety	Estimated tonnage of fresh-cut stems and leaves per acre average	Approximate nitrogen content of total plant per ton of fresh-cut stems and leaves	Estimated nitrogen added to soil per acre by average crop turned under	Estimated time necessary to mature crop for green manure
	tons	lbs.	lbs.	months
...laria juncea	18	20.2	364	3
...ptera Anil	12	28.4	341	6
...aria Saliana	14	23.5	329	3
...aria incana	17	18.9	321	3
...a americana	14	20.0	280	5
...alia ensiformis	16	16.3	261	5
...bium Deeringianum	18	14.0	252	4 1/2
...rcean	11	20.0	220	4
...a Chamaecrista	8.5	23.7	201	3 1/2
...a Cajan	15	12.1	182	3
...a villosa	13	13.3	173	6
...olium fœnumgræcum	9	19.0	171	6
...rbet Soya	8	21.2	170	4
...cadium sericeum	7.5	19.8	149	3 1/2
...aria aegyptiaca	12	11.4	137	4
...ous luteus	15	8.7	131	3 1/2
...ulus semierectus	6.5	17.3	112	3
...cuna Mungo	7	15.5	109	3
...ides bifloras	8	12.5	100	4 1/2
...osa pudica	3	13.7	41	6

Of the legumes given in the tables, 7 occur commonly as weed Hawaii; of these the most important appear to be the wild "rattlepod (*Crotalaria Saltiana* and *C. incana*). These plants grow wild and s adapted to nearly every kind of soil and climate occurring in Hawaii. T are recommended by the writers as a green manure for pine-apples. T are also especially valuable for the manganese soils of Oaku, as being ab the only legumes apparently uninjured by the black manganiferous s The chief objection to these wild rattlepods in the woody character of t stems. This woody character appears to the writers, however, as of co derable advantage in other ways under Hawaiian conditions, since r decay is there undesirable as the humus is soon "burnt out" of the soil Of the other plants used in the experiment, *Indigofera Anil*, *Cassia Cham crista*, *Phaseolus semierectus*, *Desmodium uncinatum* and *Mimosa pud* are also weeds in Hawaii.

1127 - **Studies of Leguminous Plants as Green Manure.** — GANGULEE, N., in *The P Agricultural College Magazine*, Vol. VIII, No. 3, pp. 141-156. Poona, 1917.

In India it has been repeatedly shown that the chief need of the grow crop which cannot be usually supplied from the soil is nitrogen. Theref one of the principal problems of Indian agriculture is to maintain the trogen supply of the soil. The most natural and convenient source of material is farmyard manure. If this manure is deficient, as it is in v many parts of India, the next resource is green manure composed of on other of the many leguminous crops which occur in the country. The sent article is a preliminary study of some aspects of nitrogen fixatio certain of the leguminous plants suitable for green manure, the conclus reached being as follows:

1) *Dolichos Lablab* L. — Nodules commence to form on the root of plant about fifteen days after germination, chiefly being concentrated on larger roots. The smaller roots gradually become covered with nod except at the extremes of the rootlets. The nodules on the distal port of the root gradually disappear after the plant is nearly full grown and a few large nodules as large as a pea remain on the bigger roots. nitrogen in the plant gradually increases from 0.21 per cent. in the d seedling to 3.7 to 3.9 per cent. in the dried plant at the flowering stage. these experiments the part above ground was always considerably r in nitrogen than the roots.

2) *Cicer arietinum* L. — The progress of the nodules on the roots of crop was curious. They were chiefly, though not exclusively, on the r roots. After the fifteenth to twentieth day from germination the large dules on the main roots shrank, but numerous small ones on the finer r

(1) *Crotalaria Saltiana* is very vigorous. It grows as well in arid regions where the r is less than 500 mm., as in very wet regions where the annual rainfall exceeds 5 m The seeds germinate very quickly, the plants need no care. This species is attacked parasite, except the blue-butterfly, which simply reduces the number of pods. It is e able for forage. (*Report of the Hawaii Agricultural Experiment Station*, 1914, p. 21. ington, 1915.

re formed. The nitrogen in the plant gradually increased from 0.23 r cent. in the dried plant just after germination, to 0.55 per cent. on the ant at the end of the seedling stage. The difference between the amount nitrogen in the above-ground and the below-ground portions of the seedgs was very marked, the former containing as much as five or six times much as the latter.

3) *Crotalaria juncea* L. — In the first series of experiments where only healthy plants were obtained which never grew beyond the seedling stage, dules were first formed chiefly on the top root and afterwards tended to appear. In the second series, where the plants remained healthy throught, the nodules were found throughout the root system, and they seemed rticularly luxuriant in presence of excess of phosphates. The amount nitrogen rapidly increased during the growth of the plant, the maximum t being reached before full flowering. The most rapid increase took ce between the eleventh and the twenty-fifth day of growth. The vir of nitrogen accumulation seems almost equal with excess of phosphoric d and with excess of lime, while excess of potash gives distinctly inferior sults, except in the very early seedling stages.

4) *Phaseolus Mungo* L. var. *radiatus* Roxb. — In the second series of periments with this crop, no nodules were formed until the seedlings were n days old. Then, very small nodules first appeared on the plants with cess of potash and with excess of lime, almost entirely on the main roots. e number on the lateral roots then gradually increased, and in the most althy plants they were found all over the root system of the flowering ants. The presence of excess of lime seemed to encourage the fixation of trogen and the development of nodules particularly, but almost equal sults were obtained with excess of phosphoric acid.

28 - **Potassium Chloride from Mother Liquor in Manufacture of Sea-Salt.** — NISHIMURA, T., in *Kogyo-Kwagaku-Zasshi*, Vol. XX, pp. 587-624, 1917; abstract in *Journal of the Society of Chemical Industry*, Vol. XXXVI, No. 19, p. 1046. London, October 15, 1917.

The annual production of bittern in Japan is 240 000 tons. When shly obtained its composition is as follows:

Magnesium chloride	12.27 — 20.63 %
Potassium chloride	2.30 — 3.45
Magnesium bromide	0.26 — 0.47
Magnesium sulphate	6.04 — 7.62
Sodium chloride	2.60 — 7.06
Water	67.53 — 69.30

This bittern is considered one of the most important sources of potash Japan. The isolation of the potassium chloride is described, by which 6 % of the potassium can be recovered as chloride of 80 % purity.

29 - **Seeds and Plants Imported into the United States.** — FAIRCHILD, D. (Agricultural Explorer in Charge), in *U. S. Department of Agriculture, Bureau of Plant Industry, Inventory* No. 38, pp. 105 + X plates. Washington, 1917.

In this inventory are described the plants imported by the Office of reign Seed and Plant Introduction of the United States Department of

Agriculture during the period January 1 to March 31, 1914. It includ Nos. 36 937 to 37 646, among which may be mentioned: —

Kerguelen cabbage (*Pringlea antiscorbutica* Brown), characterised by its dense white heart and taste resembling mustard and cress;

The " Liitou " (*Phaseolus aureus* Roxb.), used in China for the extraction of a starch used for laundry purposes, and which is superior to wheat or maize starch;

The Chinese chestnut (*Castanea mollissima* Blume), of which two superior fruiting varieties have been discovered which may prove valuable on account of their resistance to bark disease;

Certain varieties of Abyssinian flax which, like barleys of the same origin, may suit dry climates (California);

A perennial grass from India, *Ischaemum binatum* (Retz.) Buse, which may be used in the paper industry;

The Takuara bamboo of Paraguay (*Bambos guadua* Humb. and Bonpl.)

Sorghum varieties from Africa;

A collection of cereals from the Tulun Experiment Station in Russia

Fruit varieties from Brazil;

The Sumatra Cassowary tree (*Casuarina sumatrana* Jungh.).

1130 – **Classification of the Indian and Far Eastern Species of the Genus *Strichnos*: Study from the Royal Botanic Gardens, Kew, England.** — See No. 1131 of this *Review*.

1131 – **The Morphological Examination of Dog-Berries.** — GRIEBEL, C., in *Zeitschrift für Untersuchung der Nahrungs- und Genussmittel*, Vol. 34, Pt. 5, pp. 233-235, 2 figs. Berlin, September 1, 1917.

From the point of view of the utilisation of the fruit of the dog-wood (*Cornus mas* L.), the fleshy part as jam, and the kernel as a substitute for coffee, the author gives an anatomical description of it in order to ascertain its food value, especially as jam. It seems that the blue-black colouration of the tissues of the fruit, obtained by treatment with potassium hydrate solution, is characteristic of the dog-berry.

1132 – **A Chemical Study of the Seeds of *Hydnocarpus venenata*, *H. alcalae* and *Pangium edule*.** — See No. 1166 of this *Review*.

1133 – **Environment of Seeds and Crop Production.** — HALSTED, BYRON, D. and OWEN EARLE, J., in *The Plant World*, Vol. 20, No. 9, pp. 241-270. Baltimore, September, 1917.

The results of a series of experiments carried out at the New Jersey Agricultural Experiment Station at New Brunswick for the purpose of determining the effect which might be exercised on germination and early growth by placing seeds in different positions (1), and also the relative viability and vigour of seeds from different positions in the pod.

In all the experiments, seeds of the Scarlet Runner bean were employed. Only 3 positions of the seeds were tested : 1) laid flat ; 2) with eye u

(1) See on the same subject: ARTURO BRUTTINI, Influenza della posizione dei semi terreno sulla durata della germinazione, in *Stazioni sperimentali agrarie italiane*, V XXXVIII, Part V-VI, pp. 406-469. Modena, 1905.

with the eye down. The depth of planting was uniformly 2 inches below the surface, and special care was taken to have the centre of gravity of each seed, however placed, level with the surface of the soil, after which a cover of fine earth was added, and the top of the bed brought to a level by means of a straight-edge. There were 6 plantings in duplicate, making 4050 seeds in all. At the same time, a test was made of the relative value of planting seed from pods with 2, 3 and 4 seeds respectively, and also of the bearing of the position of the seeds in the pod upon their viability and vigour.

All these tests were made during the period extending from November 1, 1916 to March 12, 1917. No record of the soil temperature was made during the first series, but it was comparable with that for the last one. It is noted that Scarlet Runner seeds are sensitive to the soil heat and their viability falls rapidly with the temperature; for example, from 92.9 per cent. in early December to 76.0 per cent. in February (18.1° C.), and rose again to 94.2 per cent. in March (21.5° C.).

The seedlings were harvested when they averaged near 300 mm. in length, the periods of growth ranging from 24 to 30 days. The averages for the time required for the seedling to reach the surface of the soil (emergence) are: **flat**, 12.54 days — eye up, 13.02 days — eye down, 12.8 days. Table I gives the general averages for all the seeds, and demonstrates that the greatest vigour is associated with the flat seeds, but that the hypocotyl is longest where the seeds are planted with the eye down. The loss of hypocotyl length is balanced by the longer first internode, so that the length from root juncture to the 2nd node is practically the same for all 3 soil positions, but after that point is passed, the seedlings from seeds planted with the eye up fall behind the others. Table II shows the relations of number of seeds and their position in the pod to weight, viability and vigour. The results, taken as a whole, indicate that the common practice of dropping seeds flat upon the soil is satisfactory, The comparatively smaller seeds when borne 2 in a pod are superior in viability and vigour, and the middle seeds from 3 and 4-seeded pods exceed all others in weight.

TABLE I — *Averages for the 3 positions in the soil.*

	Flat	Eye up	Eye down
Viability	85.12 %	81.00 "	82.22 %
Air dried green weight	8.08 grm	8.78 grm	8.74 grm
Hypocotyl	12.54 mm	11.03 mm	12.90 mm
1st internode	137.17 "	137.00 "	130.88 "
2nd internode	97.43 "	93.21 "	96.71 "
3rd internode	16.80 "	35.80 "	49.56 "
Total length	310.11 "	292.11 "	317.83 "

Both the number of seeds, and their position in the pod are environmental factors that influence the crop-producing value of the seeds. If the selection of seeds for planting is with pods only, the first choice is those

bearing 2 seeds. If only position in the pod is considered, the middle seed are chosen, but if both pod and position are regarded, the tip seeds in 2 seeded pods are superior to all others, and the second choice is the third from the base in 4-seeded pods, followed closely by seeds from the other two middle positions.

The second seed from the base is always of high grade, and may be exceeded by the one next above, when the pod has 4 seeds.

TABLE II. — *Relations of number of seeds and their position in the pod to weight, viability and vigour.*

	Seed weight	Viability	Vigour (seedling weight)
2-Seeded: base	0.847 grm	87.30 %	7.741 gr
2-Seeded: tip	0.908	84.18	8.838
3-Seeded: base	1.066	81.53	7.329
3-Seeded: middle	1.171	87.51	7.900
3-Seeded: tip	1.101	75.08	7.593
4-Seeded: base	0.997	76.43	7.153
4-Seeded: first middle	1.082	83.76	8.038
4-Seeded: second middle	1.127	84.40	8.193
4-Seeded: tip	1.107	83.73	7.764
Pot averages			
2-Seeded	0.928 grm	85.74 %	9.065gr
3-Seeded	1.115	81.37	7.627
4-Seeded	1.078	82.08	7.408
Position averages			
Base	0.970 grm	81.75 %	7.408 gr
Middle	1.138	84.08	8.038
Tip	1.041	81.00	7.015

1114 — **Studies of the Phosphorus and Potassium Requirements of the Barley Plant During its Different Periods of Growth.** — PEMBER, F. R., in *Agricultural Experiment Station of the Rhode Island State College, Bulletin* 160, pp. 50, charts I-III, plates I-I Kingston, R. I., U. S. A., 1917.

Experiments conducted with the intention of determining the actu requirements of barley plants for potassium and phosphorus during the di ferent periods of growth, where most of the conditions essential to growt were under control. Barley plants were grown in sand (Wagner pot and solutions, oats in soil (out of doors in sunken pots).

Pot cultures. — The test for the potassium requirement of the barl plant grown in sand was not continued after the first experiment becau of the large growth the plants were able to make when no potassium w added. Plants growing in sand to which little or no potassium was add showed, however, spots or flecks of brown or rusty brown on their old leaves, the discoloration being the worst when no potassium was added

Plants growing in sand to which no phosphorus was added were a dar er green and showed considerable purple in their stalks and leaves.

In four sand experiments the weight of the dry straw, or straw and roots, was much the same whether all of the phosphorus was added at the beginning and one-third at the end of the second period, or two-thirds at the beginning and one-third at the end of the second period.

In one experiment the amount of seed produced was much greater on the plants receiving their phosphorus in three equal applications instead of all at the beginning, but in another experiment plants having the full application of phosphorus at the beginning produced the most seed. Selected barley seed had a variable phosphorus content, but the weight of the whole dry plants grown from similar seeds bore no relation to the amount contained.

Plants grown for nineteen days from planting, with the full application of phosphorus at their disposal, were not markedly larger than those having only the one-third application of phosphorus, but the amount of phosphorus recovered from the former was more than double that from the latter. The amount of phosphorus recovered from the plants harvested at the end of the second period was much the same whether the full application of phosphorus was added at the beginning, or one-third at the beginning of each of the first and second periods. The best recovery of phosphorus by the barley plant grown in sand was about 89 per cent. of the amount added.

Oat plants grown in soil which received the full application of phosphorus before planting were larger and recovered more phosphorus than those which had three equal applications, but the amount of seed produced was in favour of the latter. In the following season it made little difference in the growth of the plants and the amount of phosphorus recovered whether the full amount was added at the beginning or in three equal applications. The best recovery of phosphorus by the oat plant grown in soil was one-fifteenth of the amount added.

Solution cultures. — Ten barley plants which received an average of 3 mgm. of phosphoric acid per week for the first ten weeks, absorbed nearly all of it. Plants receiving the maximum amount of phosphorus absorbed about 30 mgm. of phosphoric acid per week from the third to the sixth week, inclusive. The small application of phosphorus was sufficient for the needs of the plants, but their phosphorus content was much increased by the largest application.

Plants receiving minimum amounts of phosphorus for the first eight weeks of their growth were so handicapped that the effect was noticeable, not only in their size, but in the colour of their stems and leaves. Those receiving liberal amounts of phosphorus during the next four weeks made a rapid growth and appeared perfectly normal at harvest. The minimum amount of phosphorus required for ten plants having the optimum amount of seed was about 75 mgm. phosphoric acid.

Plants grown in distilled water and receiving but 80 mgm. of potash did not mature seed, were limp and showed most markedly the characteristic brown spotting on their stems and leaves. Under similar conditions the amount of potassium recovered from the seed varied but little, regardless of the amount of potassium at the disposal of the plants, while the

amount obtained from the seed-free plants was influenced markedly by the amount added.

The amount of potassium, nitrogen or phosphorus absorbed by the plants was influenced greatly by the relation of the other nutrients.

Changes in the cultural methods, viz. aerating the solutions daily, keeping a piece of fresh charcoal in the solutions, or lowering the temperature of the solutions in summer weather, had no noticeable influence on the growth of the plants.

Titrations of certain composite samples of the residual solutions showed but slight variations from the neutral point.

In the small quantities used, the addition of boron or manganese (44 mgm. and 110 mgm. respectively for ten plants) to the cultural medium had no apparent effect on the growth of the plants.

Results of tests made for potassium and phosphorus in distilled water in which plants were allowed to remain for from one to two weeks after they were full grown, did not substantiate the belief that either element was freely given off by way of the roots at maturity.

1135 – **Daily Variation of Water and Dry Matter in the Leaves of Maize and the Sorghums.** — MILLER, E. C., in *The Journal of Agricultural Research*, Vol. X, No. 1 pp. 11-45. Pl. 3. Washington, D. C., July 2, 1917.

In connection with a previous study of the water relations of maize and the nonsaccharine sorgums (1), it was thought advisable to determine the daily variation of the water and dry matter in the leaves of these plants. A knowledge of the variation of the water in the leaves should throw some light on the relative ability of these plants to absorb water from the soil and to transport it to regions of lossf rom transpiration, while a study of the daily variation of dry matter in the leaves would permit a comparison of the relative power of the plants to manufacture food under different climatic conditions. The experiments herein reported were conducted during the summers of 1914, 1915, and 1916 at the State branch Experiment Station at Garden City, Kansas, the variation of the water and dry matter in the leaves of maize and the sorghums being determined.

The plants used in these experiments were Pride of Saline corn (*Zea mays*), Blackhull kafir (*Andropogon sorghum*), and Dwarf milo (*A. sorghum*). In 1914 and 1915 the plants were grown in alternate rows on the same plot, while in 1916 the experiments were made with plants grown on a series of $^1/_{80}$-acre plots. The plants were grown in a sandy-loam soil that had been fall ploughed and irrigated with approximately 8 inches of water. The crops were surface-planted in rows 44 inches apart. After the plants were a few inches high the corn was thinned to a distance of 2 ft. between the plants, Blackhull kafir to 1 ½ ft., and the Dwarf milo to 1 ft. The plots were hoed to keep the weeds down, but no other cul-

(1). See MILLER, E. C., Comparative Study of the Root Systems and Leaf Areas of Maize and the Sorghums, in *Journ. Agric. Research*, Vol. 6, No. 9, pp. 311-332, 3 fig., pl. 38-44. 1916. Also Relative Water Requirement of Maize and the Sorghums, *ibid.*, Vol. 6, No. 13, pp. 473-484, 1 fig. pl. 70-72. 1916.

tivation was given during the growing season. They received no water after the fall irrigation, except that which came from the rainfall.

Four of the experiments in 1914 extended only through the daylight hours, but all the other experiments ranged in length from 24 to 48 hours. In these experiments the water and dry matter in the leaves were determined every two hours during 22 days and 10 nights for maize and milo and during 18 days and 10 nights for kafir.

The amount of water and dry matter in the leaves of a given variety of plant was obtained for any 2 hour period from 30 leaf samples, each with an area of 1 square centimeter. A single leaf on each of 30 representative plants furnished all the samples for an experiment extending over any desired length of time. From the results thus obtained, the amount of water and dry matter for each square meter of leaf, the percentage of water on a wet basis, and the percentage of water on a dry basis were calculated.

The amount of water in the leaves of milo was found to be much lower at all times of the day and night than that of either maize or kafir leaves at a like stage of development, while the average water content of the maize and kafir leaves at the same age was practically the same. The water content of the leaves of maize, kafir, and milo averaged 118.5, 120.0 and 107.0 grm., respectively, for each square meter of leaf during the day periods and, taken in the same order, 127.9, 132.7, and 115.5 grm. for the night periods. The average variation per sq. meter of leaf between the water content of the leaves during the day and night was 9.4 grm. for maize, 12.7 grm. for kafir, and 8.5 grm. for milo. The average variation between the maximum and minimum water content of the leaves from 7 a. m. to 7 p. m. was 13.8, 8.4 and 7.8 grm. for each sq. meter of leaf respectively for maize, kafir, and milo, while the average range between the maximum water content of the leaves during the night and the minimum amount during the day was 23.8 grm. for maize, 25.9 grm. for kafir, and 21.7 grm. for milo.

During the 22 days the evaporation as measured by a Livingston porous-cup atmometer reached a maximum 18 times between 2 and 3 p. m. and 4 times between 3 and 5 p. m. In two-thirds of the observations for maize and milo and in nine-tenths of the observations for kafir the minimum water content of the leaves under the conditions of these experiments occurred from two to four hours earlier than did the maximum evaporation as measured by the porous-cup atmometers. For the rest of the observations the minimum amount of leaf water occurred at the time of maximum evaporation.

The average variation between the maximum and minimum percentage of water in the leaves on a wet basis during the day from 7 a. m. to 7 p. m. was 3.5 for maize, 3.2 for kafir, and 4.5 for milo. On the same basis the average variation between the minimum percentage of water during the day and the maximum percentage during the night was 5.4, 5.9, and 6.0, respectively, for maize, kafir, and milo. The average difference between the minimum and maximum percentage of water on

a dry basis during the day from 7 a. m. to 7 p. m. was 39.5 for maize, 31.1 for kafir, and 35.9 for milo. The average range between the maximum and minimum water content on this basis during the night from 7 p. m. to 7 a. m. was 37.5, 47.5, and 40.0, respectively, for maize, kafir, and milo, while the average range between the minimum percentage of water on this basis during the day and the maximum percentage at night was 67.8 for maize, 67.2 for kafir, and 51.2 for milo.

The dry weight of a given area of milo leaf was always found to be greater than an equal area of either maize or kafir leaves at the same stage of development. The average dry weight of a square meter of leaf for all the observations made was 48.2 grm. for maize, 52.5 grm. for kafir, and 56.2 grm. for milo. The average difference between the minimum and maximum amount of dry matter in the leaves for each square meter of leaf from 7 a. m. to 7 p. m. was 4, 4.8, and 8.0 gm., respectively, for maize, kafir, and milo. The increase in dry matter began at daybreak and the maximum amount of dry matter in the leaves occurred in most cases between 2 and 5 p. m. The rate of increase of the dry matter in the leaves during the portion of the day when the climatic conditions were severe was much higher for milo than for either maize or kafir.

The results indicate that, under the conditions of these experiments the sorghums and, more particularly, milo can absorb water from the soil and transport it to the leaves more rapidly in proportion to the loss of water from the plant than can maize. As a result of this ability, the sorghums can produce more dry matter for each unit of leaf under severe climatic conditions than the corn plant.

The article contains a number of graphs and numerical tables illustrating the various points discussed.

1136 – **The Action of Certain Organic Substances in Plants.** — CIAMICIAN, G. and RAVENNA, C., in *Gazzetta chimica italiana*, Year XLVII, Pt. II, No. 3, pp. 90-107. Rome, August 31, 1917.

In a series of previous papers (1) the authors studied the action, in adult plants, of organic compounds inoculated in the solid state into the stem, or else absorbed by the roots. These two methods gave, in some cases indications, in others proof, that, by making plants absorb certain aromatic substances, the related glucosides form within the plants themselves. Thus, by inoculating saligenin into maize, salicine is obtained in the plant; by making the roots of beans absorb benzyl alcohol, and by inoculating it into maize, the formation of a glucoside, probably the benzyl glucoside was observed; by inoculating into the thorn-apple and tobacco: pyridine, piperidine, carbopyrrholic acid, and, into tobacco alone: asparagine, ammonia, glucose and phthalic acid, the following was observed; "Pyridin.

(1) *Memorie della R. Accademia di Bologna*, Series VI, Vol. 5, p. 29 (1907-1908); Series VI, Vol. 6, p. 129 (1908-1909); Series VI, Vol. 7, p. 143 (1909-1910); Series VI, Vol. 8, p. 17 (1910-1911); Series VI, Vol. 9, p. 71 (1911-1912); Series VI, Vol. 10, p. 143 (1912-1913); Series VI, Vol. 1, p. 339 (1913-1914). — *Rend'conti della R. Accademia dei Lincei*, Vol. XVIII, 1st. Half Year, p. 419 (1909); Vol. XVIII, 2nd. Half Year, p. 594 (1909); Vol. XX, 1st. Half Year, p. 392 (1911); Vol. XX, 1st. Half Year, p. 614 (1911). (Author)

as no specific influence on the increase of alkaloids; in tobacco, the effect f ammonia is the same. The influence of asparagine is more remarkable; determined the greatest number of alkaloids. Wounding the plants lso has the effect of increasing the nicotine; it is, therefore, probable that, s a rule, a wound increases the alkaloid content of alkaloid plants in the me way as it increases the hydrocyanic acid in cyanogenetic plants. Glu- se also causes a marked increase in nicotine; in this respect the experi- ents on the formation of hydrocyanic acid are comparable with the pre- ent experiments. Finally, it should be noted that inoculation with phthalic id caused a minimum percentage of alkaloids (‰), so that there was ry little difference between such plants and the control plants. If the fluence of the lesion may be considered constant in all the cases studied, may be said that phthalic acid decreases the amount of nicotine" (*Rendiconti della R. Accademia dei Lincei*, Vol. XX, 1st. Half Year, pp. 392-394; p. 614-624; Rome, 1911).

The work summarised is the first of a new series of publications on germinating plants and vegetable enzymes. The authors proposed to study if he substances when inoculated into germinating seeds produced the same ffect as on adult plants. For this purpose seeds of maize, wheat, bean, upin and vetch were chosen and saligenin, hydroquinone, pyrocatechine, enzyl alcohol, gallic acid and tannin were tested. The following facts were bserved among others, by making the roots of germinating maize and eans absorb saligenin, salicine is formed; in the germinating seeds of maize nd beans treated with benzyl alcohol, there are formed traces of a compound hich, when heated with hydrochloric acid, gives benzyl alcohol; in germin- ting beans watered with at 1^{0}_{00} hydroquinone solution, is formed a com- ound, probably of a glucoside nature, similar to arbutine, which does not ydrolyse with emulsine, but separates out with sulphuric acid, heat, etc.

Finally, even in germinating plants which have to live on reserves, lucosides are formed in a similar way to when the substances are introduced nto adult plants, either by inoculation or absorbtion by the roots.

If large quantities of substances are to be used, inoculation is the bet- er method; on the other hand, in experiments which do not require large uantities of the substances to be transformed it is preferable to water the erminating seeds with dilute solutions of the substance, because the mat- er to be examined is less cumbrous if the woody part is absent.

By using germinating plants it is easier to study the phenomena in the bsence of light; it was thus possible to observe the formation of salicine n the dark, which proves that light is not necessary to the genesis of gluco- ides. Moreover, the fact that salicine was formed in plants incapable of ssimilation does not coincide with the theory of certain authors, according o whom glucosides are reserve materials because they are formed in plants hich, growing in darkness, cannot contain an excess of glucose. This, owever, does not imply that the aromatic substances occurring in plants ither in the free state or as glucosides, should not be considered as waste natter. It seems more probably that the substances which appear acces- ory play some part, though, in most cases, its nature is still unknown.

1137 – **The Diastasic Degradation of Inulin in the Root of Chicory.** — WOLFF, J. a GESLIN, B., in *Comptes rendus des Séances de l'Académie des Sciences*, Vol. 165, No pp. 651-653. Paris, November 5, 1917.

It is pointed out that J. REYNOLDS GREEN was the first to study t transformation of inulin under the influence of diastases and that he w of opinion that *inulase*, a specific enzyme of inulin, transformed it into l vulose (1).

The authors have studied the disintegration products of inulin by t diastases which accompany it, giving preference to the root of chicory, o of the roots in which there is the greatest accumulation of inulin at t time of maturity. The results of their investigations show that the disi tegration of inulin in the root under the influence of diastases is continuo and results in a *hexose*. The Authors call *inulids* the intermediate no reducing products which form during this action.

These *inulids* (2) may be transformed into reducing sugar by the h drolysing power of the juice itself. The most varied yeasts ferment it easily as saccharose or maltose. Moreover, the use of various yeasts sho that there are inulids of unequal resistance which, by their different stat of condensation, recall the various dextrines.

The hydrolysing action of chicory juice on the inulids contained i this juice is due to a diastase which seems to be identical with yeast s crase. Although the hydrolysis of the inulids is slower, similar results a obtained by treating either inulids or a saccharose solution with an aqueo maceration of yeast or fresh chicory juice. On the contrary, neither t one nor the other have any action on pure inulins.

1138 – **The Acid Excretion of Roots.** — COUPIN, HENRI, in *Comptes rendus des Seanc l'Académie des Sciences*, Vol. 165, No. 17, pp. 504-506. Paris, October 22, 1917.

It is well known that at least some roots excrete an acid liquid capabl of acting on the particles of the soil. Litmus paper is used to test this, bu is too rough a method, for, either there is no contact between the paper an the root, or else the contact is so close that the root is injured.

In order to overcome these drawbacks the author devised a metho which is extremely sensitive. One per cent, agar-agar (in spring wate weak nutritive solution) is coloured blue with lituus. A transparent jel may thus be obtained which may be run into test-tubes, and in which youn germinating plants take root well. In order to avoid bacterial action t tubes are sterilised in the autoclave, and only plants obtained aseptical by superficial sterilisation of the seeds which have been expanded in ster lised water and germinated on sterilised soaked cotton are used.

Before long the circumference of the root is surrounded by a pink ba which gradually spreads all over the tube, showing the formation of a acid liquid, the nature of which (malic acid ?) is not yet known.

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(1) Cf. J. REYNOLDS GREEN, *The Soluble Ferments and Fermentation*, p. 75. Cambri 1899. (2) TANCRET'S *synanthrine* certainly belongs to the "inulid" group. (Auth

Of the 26 seedlings tested by the author all gave a positive result. As they were chosen at random from among the principal biological types of plants, it seems reasonable to admit that *the formation of an acid liquid by roots is a general fact*, or, at least, very widespread, though at times reduced to traces.

The same experiments showed that *this acid formation begins as soon as the root emerges from the seed and continues till it dies*. In some cases, however, the excretion seems to stop early. The chief differences found between one root and another lies in the *intensity of the acidity* of the excretion, which is, moreover, demonstrated vaguely by the degree of the pink colour in the litmus jelly.

To complete these studies a further set of experiments was carried out placing a thick layer of the litmus jelly on glass and growing the roots on the surface in moist air. It was seen that, contrary to the statements generally accepted, the *excretion is not caused by the root hairs*, which always remain white, or, at the most, take on the blue colour of the litmus, but never turn pink. *The excretion really occurs in the superficial cells of the cortex*, in the zone covered by absorbant hairs, as well as in that which has not yet developed them (between the point and the hairy zone) and that which has lost them. It occurs both in the roots which, in the jelly, have absorbant hairs, and in those which have not.

It was also proved that *the formation of an acid liquid is particularly intense on the superficial parts of the cortex which have been injured* and which then turn dark red.

1139 - **The Selection of Lupins of Low Alkaloid Content, in Germany** (1). — KOERNER, TH., in *Landwirtschaftlicher Jahrbuch*, Vol L, p. 113-144. Berlin, 1917.

In Germany the cultivation of lupins (*Lupinus luteus* and *L. angustifolius*) has not developed as much as it deserves to, in light soils, on account of the bitterness of the seeds and the toxic substances they frequently contain.

The author has investigated the possibility of decreasing, by selection, the amount of bitter substance contained by the seeds in order to avoid the long treatment required to free them from bitterness. In his experiments, carried out at Mahndorf in 1907, he adopted two methods : - 1) *hybridisation* ; 2) *individual selection*.

1) *Hybridisation*. — Crossing the yellow lupin (*Lupinus luteus*) and the blue lupin (*L. angustifolius*) with other much less bitter species lead to no decrease in the bitterness of the seeds, as in the previous experiments by FRUWIRTH.

2) *Individual selection*. — Having observed marked individual differences in the alkaloid content of the direct descendants of *L. luteus* and *L. angustifolius*, the author isolated and propagated separately individuals with a low alkaloid content. At the same time he took into account all the morphological and anatomical characters capable of eventually facilitating

(1) See *R.* February 1917, No 101. (*Ed.*).

the work of selection by allowing special correlations to be discovered. 1909 and 1910 he made careful observations and investigations, determin the alkaloid content by STEINER'S method, which, though not very ex has not yet been replaced.

In some lines the character " alkaloid content " appeared fixed transmissible, plants with very bitter seeds producing descendants with same character, and vice versa ; but, in other lines, no transmissibility this character was observed so that it is not yet proved. It may be that individual differences observed are simple " fluctuations ", of no valu selection.

1140 – **The Improvement of the Jute Crop by Pure Line Selection in British India**
FINLOW, R. S., in *The Agricultural Journal of India*, Vol XII, Part II, pp. 283-290, cutta, 1917.

In the plantations of jute (*Corchorus capsularis* and *C. olitorius*), in vidual plants are frequently found which are distinguished by their ta stature and therefore — other things being equal — a correspondi greater yielding power than others.

In some cases, individual, pure line selection has shown that the c racters of luxuriant growth and high fibre yield are fixed and transmiss to the offspring. By such selection was obtained, amongst others, a r called Kakya-Bombai of which, in 1917, sufficient seed was sold to sow 1 acres. This race is much in demand on account of its productivity; Dacca Farm, the highest yield was 34 maunds (nearly 7 bales) per ac

Recently, attention has been directed not only to the quantity, b also to the quality, of the fibre, and a careful chemical and microsco examination of the fibres is made another basis for pure line culture.

It is necessary to combine in the same type, high yielding power a the maximum strength and durability of fibre. The writer hopes that ul mately this will be obtained by means of suitable hybridisation exp ments.

1141 – **Variations in Young Sunflower (*Helianthus annuus*) Plants in Colorado**
TOCKERELL, T. D. A., in *The Journal of Heredity*, Vol. VIII, No. 8, pp. 361-362, Washington, August, 1917.

When cultivating new varieties of sunflower, the writer (Profes at the University of Colorado) had occasion to remark variations in young plants. Thus the *coronatus* variety, which has ligulate flowers w chestnut-red tips, could always be distinguished, even when the seed l only just germinated, by the violet colour of the hypocotyl and of the cot dons. The horticulturist can therefore at once select the young seedli of this variety, and reject the others. On the other hand, it is impossi to distinguish the varieties with wine-coloured flowers.

The writer describes in detail 4 modifications of the cotyledons wh he observed. The differences occur both in structure and colour. Th characters are evidently hereditary, as are all the others, and their se gation would appear to occur according to Mendel's law. This is shown the fact that there are as many normal types as variants, but no intermed types. In Holland, DE VRIES obtained a strain of sunflower produ

eds with united cotyledons, and though he was unable to isolate a pure
e, he proved the hereditary nature of this character. The peculiarities
splayed by these seedlings must thus be attributed to factors of germina-
on, that is to say, to determinants which cannot be limited to the first
riod of growth, though their visible effects are confined to this period.

42 - **The Improvement of Hops by Crossing and Selection.** — SALMON, E. S., in the *Journal of the Institute of Brewing*, Vol XXIII, No. 2, pp. 60-82. London, 1917.

The results of a series of studies and experiments made of late years y the writer at the South-Eastern Agricultural College, Wye, Kent.

The characters of the hop plant which are of chief importance to the rewer are :

1) Aroma.
2) The resins content.
3) Fruitfulness.
4) Resistance to disease.

The effect of the environment : climate and soil, especially the latter, ave an influence upon these characters, causing them to vary in degree and ntensity, without, however, producing in any given variety, one or more f the characters peculiar to another. Thus, the resin content of the German op Spätbayrischer, cultivated in England under the name " Late Bavarian ", lways remains higher than that of the English varieties, though it varies, ithin wide limits, according to its environment.

The above-mentioned 4 characters are " fixed " or " unit " characters, hich there are scientific reasons for believing, could be combined separa-dy in the hybrid plant.

NATURE OF THE HOPS USED FOR THESE EXPERIMENTS. — 1) *Aroma.* — As egards aroma, the English Golding variety is especially suited for making elicate flavoured pale ales ; the Fuggles variety can also be used for this urpose, but not Colgate. For the manufacture of Lager beer, (a beer con-aining little alcohol, but rich in extracts), no English hops are suitable, so ecourse must be had to German varieties (especially Saaz), or to the French ariety Bourgogne.

2) *Resin content.* — The percentage of resin over a period of 16 consecutive onsecutive years (1898-1913) varies for English hops from 8.03 per cent. o 9.04 per cent. During a period of 6 years, the German variety Halletau roduced the following percentages of resin : minimum, 9.29 per cent.; maxi-um, 17.08 per cent ; average, 13.3 per cent. The German varieties Spät-ayrischer, Elsass, and Auscha Grün, when grown in the United Kingdom, roved superior to the English varieties as regards resin content, but had he defects of producing little fruit and of not being resistant to disease nd bad weather. The American hops are especially rich in resins (of which regon Cluster contains as much as 16.8 per cent.), but they are difficult o acclimatise in England. These data clearly show that the aim of selection hould be to unite in a single type the aroma and resistance of the English op with the high resin content characteristic of the American varieties.

The fact that the hop is dioecious is unfortunate from the selection oint of view, since the seed characters transmitted by the male parent are

unknown. The combination of the good characters present in two fem plants can only be obtained by indirect means, by discovering by spe crossing experiments which sorts of male hops possess determinants of c racters that will afterwards only appear in their female descendants.

Interesting results were obtained by crossing *Humulus Lupulus* (E ropean) with *H. americanus* (United States). These varieties differ in one another in the shape of their leaf and cone, in resin content and the co position of their ethereal oil. The writer has made 2 series of experiments:

1st. series. — Female hop plants of the Canterbury Whitebine (Engli and Amos Early Bird (English) varieties, and also one German variety, w crossed with American male plants of Oregon Cluster, but the hybr have not yet shown any commercial promise.

2nd. series. — A female hop of the American Oregon Cluster variety fertilised by several male hops, chiefly English varieties. The offspr were *true hybrids* showing all kinds of combinations of different charact derived from the two parents : weak or vigorous plants ; fruitful or unfru ful ; compact cones resembling those of the English varieties ; cones t resemble the loose, or open, American type ; and cones which are of a i and hybrid character. As regards aroma, some individuals have the arc of the best English varieties, others the black currant aroma peculiar the American hop (but still more pronounced), while a few have a new aro In 4 of the hybrids, the resin content was respectively : 19.68 per cen 17.6 per cent ; 15.7 per cent ; 14.8 per cent. ; that is to say, they were v rich in resin. Of these 4 hybrids, 2 had the aroma of Oregon Cluster, and other 2 that of the English hop. In the latter therefore the chief aim crossing was attained, namely the union in *one hybrid plant* of the aro belonging to the best English types and the high resin-producing capac of the American varieties.

At the present time, the writer has under observation between 3000 a 4000 hills. He is taking careful note of the aroma, resin content, cropp powers and resistance of these plants. It is not impossible that some these individuals may show a greater combination of characters and t some new and valuable characters may appear as these hybrids att maturity.

Further, the writer has collected at Wye, a very large number of va ties of hops from all parts of the world. Amongst these are wild hops fr the United States which are distinguished by their resistance to disease a bad seasons — *Humulus neo-mexicanus* (wild in New Mexico) and *Humu cordifolius* (indigenous in Japan). The increase in the number of bio-l racters gives rise to more possible combinations and renders easier the t of the breeder who wishes to create a new type in which the 4 above-m tioned characters are united.

Scientific research with the object of improving the hop by select has been undertaken in the following countries, as well as in Englan Denmark (Carlsberg Laboratory, Copenhagen) ; Germany (especially Weihenstephan and Weissenberg) ; the United States.

43 - **Experiments in Crossing Varieties of Tomato in the United States.** — JONES, DONALD, F., in *The American Naturalist*, Vol. LI, No. 610, pp. 608-621. New York, 1917.

The Quarter Century variety of tomato has a dwarf type of vine, red-coloured and more or less spherical fruits. Yellow Pear, on the other hand, is a standard or spreading vine, with yellow pear-shaped fruit. The 2 varieties thus differ in 3 characters.

The F_1 plants grown from the cross of these 2 varieties were standard in habit of vine (dominant character); with red fruit, which differed in shape from that of either parent, being oval rather than spherical, but more like the fruit of Quarter Century than that borne by Yellow Pear (incomplete dominance).

In the F_2 were obtained, as is easily foreseen, 3 distinct groups of individuals: 1) similar to Quarter Century; 2) similar to Yellow Pear; 3) with intermediate characters, that is to say, true hybrids. The 2 first groups have the same gametic formulae as their parents (*ascending combinations*), whereas the third group shows *new combinations*. The latter occur in *smaller numbers* than was expected, but the groups similar to their parents were found in *larger numbers* than had been predicted. The deviations above and below the expectancies are about the same in both red-fruited and yellow-fruited plants, which indicates that fruit colour is an independent factor, and need not therefore be taken into consideration.

Table I gives the most important data respecting the composition of the F_2 as regards growth habit and shape of fruit. The forms of the fruit are distinguished by the writer as pyriform, and not pyriform, the latter including the oval fruits of the F_1 and the spheroidal fruits of the Quarter Century variety.

TABLE I. — *Combinations of the Characters of Growth Habit and Fruit Shape in the F_2.*

Gametic formula	Characters of hybrids of the F_2	Number of individuals found	Number of individuals expected	Combination of Characters
A B	Standard vine — fruit not pyriform.	252	284	New combination.
A b	Standard vine — fruit pyriform	127	95	Parental (ascendant) combination.
a B	Dwarf vine — fruit not pyriform	121	95	Parental (ascendant) combination.
a b	Dwarf vine — fruit pyriform	5	31	New combination.

These figures clearly bring out the fact that the parental combinations are in excess. The writer explains this phenomenon very satisfactorily by means of BATESON'S theory of "spurious allelomorphism". The hybrids F_1, which have the gametic formula **AaBb** (where **aB** represents the Quarter Century parent, and **Ab** the Yellow Pear parent), produce 4 types of gametes: **AB** - **Ab** - **aB** - **ab** in the ratio of 1 **AB** : 4 **Ab** : 4 **aB** : 1 **ab**

(the normal proportion would be 1 AB : 1 Ab : 1 aB : 1 ab). If this explan tion is admitted, the agreement between the expected values and the found is very satisfactory, as is shown by the following figures:

	AB	Ab	aB	ab
Number of individuals found	252	127	121	5
Actual ratio	50.4	: 25.4	: 24.2	: 1
Theoretical ratio	51	: 24	: 24	: 1

The above mentioned anomaly occurs only in the pair of characte "growth habit" and "fruit shape". As regards the pairs of charact growth habit and fruit colour, or fruit colour and fruit shape, no exce observed in the parental (ascendant) variation. Table II sets forth the d referring to the combinations of this last pair in the F_2.

TABLE II. — *Combinations of the Characters "Fruit Colour" and "Fruit Shape" in the F_2.*

Genetic Formulae	Characters of F_2 plants	Number of individuals found	Number of individuals expected	Combination of Characters
AB	*red* fruit, not pyriform	289	284	Parental combinatio
Ab	*yellow* fruit, not pyriform	84	95	New combination
aB	*red* fruit, pyriform	101	95	New combination
ab	*yellow* fruit, pyriform	31	31	Parental combinatio

The figures in Table II are easily explained, if we allow that th various gametes are produced in equal proportions. In conclusion, the writ makes a long critical examination of the Mendelian characters hither discovered and studied in the tomato. He bases his observations part on data recorded by other investigators, and partly on the results of his ow experiments. There would appear to be in all 11 pairs of allelomorphs a these are given in Table III.

TABLE III. — *Pairs of Allelomorphs in the Tomato.*

		Dominant	Recessive
Fruit shape	1	Spherical	Pyriform
Fruit shape	2	Roundish, conical	Roundish, compresse
Loculation of ovary	3	Bilocular	Plurilocular
Endocarp colour	4	Red	Yellow
Epicarp colour	5	Yellow	Colourless
Fruit surface	6	Smooth	Pubescent
Vine habit and leaf surface	7	Standard Smooth	Dwarf Rugose
Leaf margin	8	Serrate	Entire
Leaf type	9	*Pimpinellifolium* type	*Esculentum* type
Foliage colour	10	Green	Yellow
Inflorescence type	11	Simple	Compound

We have thus obtained values which are by no means fixed, but which ay, in the course of the experiments, give rise to new conceptions. For e moment however, they show real progress and agree well with the odern theories of heredity and the behaviour of chromosomes. The fruit lour, which preceding investigators considered to depend upon 4 pairs allelomorphs, depends in the writers' opinion, upon 2 pairs only.

Different combinations of skin colours and flesh colours give the differ- nt coloured fruits. For example, colourless epicarp over red endocarp ives pink-coloured fruit.

44 - **Sugar Beet Seeds, in France.** — SAILLARD, EMILE, in *Comptes rendus des Séances de l'Académie des Sciences*, Vol. 165, No. 16, pp. 508-510. Paris, October 15, 1917.

Before the war, over 10 million pounds of sugar beet seeds were used nnually in France; $^4/_5$ ths. of these came from abroad, especially from Ger- many.

During the 10 years 1904-1913, the author carried out cultural experi- ents with a view to comparing the French varieties with the best German arieties. In 1915 he came to the following conclusions (1): " In 1905, the est French varieties produced less sugar per acre (about 125 lbs. less) nd had a lower sugar content (0.9 % less). At the present time they yield s much, and sometimes more, sugarp er acre and are not more than 0.3 to .4 % inferior in sugar content. It is, therefore, possible to produce in rance seeds equal to those which came from Germany ".

In 1916 and 1917, practically only Russian and French seed was used i France, particularly Russian seed.

Owing to lack of labour the author has been unable to continue his mparative experiments, but has continued to follow the development of e beet harvest, as he has done every year since 1901. He summarises the sults of his studies as follows:

1) Sugar beets have been practically as rich in 1916 and 1917 as in e 10 years previous to the war. The yield of sugar per acre has, perhaps, en a little lower, but it should be noted that cultural conditions have been s favourable owing to the insufficiency of manuring and tillage, both plied too late.

2) During the 10 years (1904-1913), the sugar content per week, per re or per root was highest at the beginning of September (507 $^1/_2$ lbs. per re, 7.95 grammes per root). During the two years 1916 and 1917, this aximum was a little later.

The figures quoted refer to good crops and exceed the current averages.

45 - **The Cultivation of Wheat by Early Sowing and Hilling-up** (2). — DEVAUX, H., in *Comptes rendus des Séances de l'Académie d'Agriculture de France*, Vol. 3, No. 31, pp. [illegible]913. Paris, October [illegible], 1917.

The author (professor in the Faculty of Science at Bordeaux) describes e results of his latest experiments on the cultivation of wheat by the method

(1) E. SAILLARD, *Journal d'Agriculture pratique*, July 1, 1915, and *Rapport sur les Essais ersaux faits sur les graines de betteraves à sucre*, published in 1915. (*Author*).

(2) See *R.* May, 1917, No. 428 and *R.* October, 1917, No. 914. (*Ed.*)

advocated by him. In January, 1917, he showed at the Academy whe showing a very fine start ; magnificent clumps had been obtained by earl sowing, followed by hilling up, and there was very reason to hope that th wheats would give high yields although the soil was only medium. As matter of fact the yields were only average, as growth did not show the sam progress after the winter as it had shown before. The yields in cwt. pe acre were as follows :

		Grain	Straw
Bordeaux	(sown August 19) . . .	10.80	20.15
Bearded Rieti	(» » ») . . .	11.62	26.07
Bon Fermier	(» » 23) . . .	13.26	27.38
Hybride inversable	(» September 23) . . .	14.22	29.13

These yields would be very mediocre in the north of France, but the are interesting for the district in which they were obtained, and consider ing the soil of the experimental plots (moorland, sandy and stony, burnin hot in summer, to which no fertiliser had been given except small quanti ties of farmyard manure), the very bad climatic conditions prevailin everywhere in 1917, and the average yield of wheat of 10 cwt. per acr which fell in 1916 to 8 ½ or 9 ½ cwt., and which, in 1917 is muc below 8 or even probably 6 cwt. in bad soils.

There is, therefore, an increase in yield amounting to from 4 to 8 cw per acre.

The results obtained led to the following conclusions : The experiment made with wheat at Bordeaux by early sowing followed by hilling-up, a though prevented for several reasons from giving the excellent results whic might legitimately have been expected from them, gave a marked in crease in yield.

The author quoted the experiments of Mr. REY carried out simult neously with his on excellent soil in the Department of Lot, which gave th following yields :

Seed sown on September 28	48 ½ cwt. per acre
» » » November 3	24 ½ » » »

It is seen here that early sowing had an extraordinary effect on the yiel for the difference in yield obtained in the same soil and by the same metho can only be attributed to the date of sowing.

1146 – Cultural Experiments with Different Varieties of Wheat at Ultuna, Sweden.

NILSSON, GEORG, in *Sveriges Utsädesförenings Tidskrift*, Year XXVII, Pt. 3, pp. 12[illegible] IX tables, 1 diagram. Malmö, 1917.

This paper gives the results of cultural experiments made in 1916 : Ultuna (Central Sweden) with 15 varieties of winter wheat and 6 varieti of spring wheat.

WINTER WHEATS. — All the varieties, including the most delicate an most productive ones, resisted the winter perfectly and when, after the midd of March, the snow had disappeared, all the fields were in excellent cond tion. From April onwards, however, the continuous rains, then the heav

apours, greatly damaged the cereals by causing rust and lodging, so the *quality of the grain* was below the average. The weight per hecto- (1) and the weight of 1000 grains varied as follows :

Variety	Weight per hectolitre (1)		Weight of 1000 grains	
	minimum	maximum	minimum	maximum
Latorp pedigree	67.8 kg		25.7 grm.	—
original of Svalöf)	—	73.5 kg	—	37.25 grm.

As for *yield in grain* the best results were given by the varieties which e resistant to rust and lodging : Sol II, which gave 3933 kg. of grain and which gave 3808 kg. In 1916 the Thule II variety only occupied the 3rd. e, with a yield of 3458 kg. ; on the other hand, throughout the period 1-1915 the " Thule " type (represented by 0826 Thule III) lead with 3446 of grain, thanks to its resistance to cold, which enabled it to do well, n in 1915, after an exceedingly hard winter, which greatly damaged the er varieties of wheat, almost entirely destroying the Bore, Sol and Wei- ls Iduna varieties. The native wheats, whose sole positive character heir resistance to cold, whereas they are very susceptible to rust and lodg- gave very bad results in 1916. Only the line 0760 of native Wärmland eat gave a grain yield of 3042 kg., but little inferior to that of the select- types ; this is probably attributable to the strength of its culms.

SPRING WHEATS. — In 1916 these gave the following results :

Variety	Yield per hectare (2)		Weight of 1000 grains	Weight per hecto- litre	Duration of vegetative period	Grain yield compared with that of Kolben per cent.
	Grain	Straw				
	kg	kg	grm.	kg.	days	
Kolben of Svalöf	2 243	6 233	29.24	68.4	141	**100.0**
of Värtan × Kolben	2 287	6 082	31.78	66.8	143	102.0
of 0201 × Kolben	2 664	6 882	31.33	69.2	141	118.8
of Kolben × 0740	2 269	5 339	31.08	70.2	131	98.5
dane native	1 732	4 429	28.40	71.4	120	77.2
dland native.	1 721	4 440	27.80	70.9	130	76.7

In 1916, complete maturity was attained only by the two native arieties, and the line 0880 of the hybrid Kolben × 0740 (0740 = selected ne of Dalarne native wheat).

The maximum yield in grain (2664 kg. per hectare) was given by line 841 of the hybrid 0201 × Kolben, but lack of maturity greatly diminished he quality of the grain.

(1) 1 *hectolitre* = 2.751 *imperial bushels*.

(2) 1 *hectare* = 2.471 *acres*.

These results show the necessity of continuing the work of hybridisation and selection in order to combine better the earliness of the native types with the productivity of the ultra-selected types. The hybrid Kolben × 0740, line 0880, already shows marked progress in this direction, with an earliness but little inferior to that of the native stock plant and a yield exceeding that of Dalarne spring wheat (" Dalarne Lantvårvete ") by 20 %.

On the other hand, taking into consideration the possibility of ultimate improvements it still remains to be seen if wheat is the most profitable spring cereal and whether, on the contrary, oats or barley would not be more satisfactory. The data of the period 1907-1916 with regard to Kolben spring wheat and the common native wheat of Central Sweden, to Fyris, Seger, Guldregn and Klock II oats, and to Primus and Gullkorn barleys, are unfavourable to spring wheats. Barley gave 1224 kg. (74 %) more grain per hectare than the spring wheats, and oats 1099 kg. (67.1 %) more. As for the yield in straw, the averages for 10 years were: spring wheat, 3642 kg., barley, 3886 kg., oats, 4076 kg. per hectare. These results are certainly partly due to the shorter vegetative period of oats and barley, which enable them to answer better to the climatic conditions of central Sweden. The earliest native spring wheats only ripen, on an average, one week after Seger oats and Gullkorn barley. The duration of the vegetative period during the years 1907-1916 is given below.

	Minimum duration		Maximum duration		Average duration	
Kolben wheat	108 days	(1911)	151 days	(1907)	131 days	
Native spring wheat	101 »	(1911)	134 »	(1907)	120 »	
Seger oats	95 »	(1911)	128 »	(1907)	112 »	
Gullkorn barley	96 »	(1911)	128 »	(1916)	111 »	

1147 – **Cultural Experiments with Different Varieties of Wheat at the Östergotland Agricultural Experiment Station, Sweden.** – SUNDELIN, GUSTAV, in *Sveriges Utsädesföreknings Tidskrift*, Year XXVII, Pt. 3, pp. 136-153. Malmö, 1917.

The productivity of a cultivated variety of wheat depends: 1) on its anatomical structure, which, in the organic equilibrium of the plant, may favour the development of the grain in varying degrees; 2) on its resistance to disease and unfavourable environmental conditions, especially meteorological ones. When this specific resistance is absent, a plant which by its nature is productive, may be a complete failure when adverse conditions are present to a marked extent. The results obtained from cultural experiments in one district cannot, therefore, be applied to others in which the soil and climate are different. Thus, the Extra Squarehead II variety, which is excellent for Svalöf, gave very bad results when sown in Östergotland in 1915 because of its slight resistance to cold, for, if this resistance is negligible in the extreme south, it is essential in central Sweden, where the winter is much longer and much more severe. For similar reasons the productivity of a variety cannot be based on the results obtained in one year, which might be either too favourable or too unfavourable. Such judgment would lead to conclusions which would be inexact, if not false. The Östergotland

tation was established with the aim of testing thoroughly in central Sweden plants created at Svalöf, or those derived from them, and, at the same time, to start experiments in order to obtain the types best adapted to the particular agronomic and climatic conditions of the district.

The paper gives the results obtained during the first 3 years, 1914-1916, with winter and spring wheats, oats, barley, rye, Leguminosae, sugar beets and mangolds. The data bearing on winter wheats are particularly interesting. The following 19 varieties were tested.: — Extra Squarehead II, Sol, Sol II, 0912 (from the hybrid Sol × Extra Squarehead II), Tystofte Smaahvede, Fylgia, 0863 and 0865 (from Smaahvede × Extra Squarehead II), Pansar, Pansar II, Weibulls Iduna, Renodlad Squarehead, 0840 (from Grenadier × Bore), Bore, Pudel, Thule, 0823 and 0825 (from Pudel × native Swedish), native Swedish. In order to do well in Östergotland, wheat must be immune to rust, have strong, elastic culms, little apt to lodge, and be resistant to cold.

1) *Rust.* — The first place is held by Pansar, which, in this respect, is almost entirely immune. Then come Tystofte Smaahvede, Fylgia and 0865 (from Smaahvede × Extra Squarehead II), which are also highly immune. On the other hand, the native types ("Svenskt lanthvete") and Renodlad Squarehead, as well as Extra-Squarehead II, suffered greatly from rust.

2) *Resistance to cold.* — 0912 (from Sol and Extra-Squarehead II), 0823 and 0825 (from Pudel × native Swedish) proved very resistant. Tystofte Smaahvede, Pansar and Bore, on the contrary, resisted cold badly. The other varieties were intermediate

3) *Resistance to lodging.* — Extra-Squarehead II, Pansar and Bore were distinguished by the strength and elasticity of their culms. Sol, Fylgia, Weibulls Iduna, Pudel and native Swedish wheat lodge easily. The other varieties are intermediate.

4) *Grain yield.* — On the averages of the 3 years 1914-1916, Sol II holds the first place with 34.05 cwt. per acre, or 10 % more than Sol, which has a yield of 30.96 cwt. and 20 % more than the native Swedish wheat, which yields 26.47 cwt. Then follow Pansar, with 32.74 cwt. and Thule II (0825 from Pudel × native Swedish) with 32.06 cwt.

Among the new varieties, tested only during the two years 1915-1916, mention should be made of 0912 (from Sol × Extra Squarehead II), on account of its immunity to rust, its earliness, resistance to cold (superior to that of the parent plants), and its high yield, 34.96 cwt. per acre, that is to say, 13 % more than Sol and 43.1 % more than native Swedish wheat. Two years are not sufficient to give a definite opinion, but, if subsequent experiments confirm the results already obtained, the variety 0912 is the wheat best adapted, not only to Östergotland, but also to Westergotland, Kalmar and Gotland.

1148 - **Red Fife Wheat in the South-West of France.** — PÉRICHON, A., in the *Journal d'Agriculture pratique*, Year 81, New Series, Vol. 20, No. 22, pp. 426-427. Paris, November 1, 1917.

Every year in the south-west of France occurs the phenomenon known

as "*coup de soleil*" (sunstroke). At the beginning of summer, a short, unc rainfall, or even only a mist, is followed by every strong sunshine. From that moment all the wheat fades more or less, particularly that which was progressing best.

The author thought that Red Fife wheat, a native of Scotland, where mists are frequent, might resist the sunstroke. During 15 years he experimented with a Red Fife wheat from the firm of VILMORIN, and the results showed that it is more resistant to sunstroke than many other varieties, particularly "Rouge de Bordeaux", which is widely grown in the district in which the tests were made.

1149 – **The Most Favourable Times for Sowing Wheat and Rye at Alnarp, Sweden.** – FORSBERG, L., in *Tidskrift for Landtmän*, Year 38, No. 35, pp. 583-589. Lund, 1917.

The author gives the results of experiments carried out at the Alnarp Agricultural Station, to determine the most favourable time for sowing wheat and rye.

WHEAT. – Varieties tested: – "Extra Squarehead", during the period 1912-1915, then "Pansar" in 1916 and 1917. Dates of sowing: 2nd., 16th. and 30th. September. During the 6 years, 1912-1917, the following average yields of grain and straw were obtained:

	Date of sowing		
	Sept. 2	Sept. 16	Sept. 30
Yield in grain per acre	27 cwt.	33 cwt.	29 cwt.
Yield in straw per acre	43 »	51 »	42 »

During 4 years out of the 6, sowing on the 16th. September gave better yields both in grain and straw. In 1915 and especially in 1917, sowing on the 2nd. September gave good results, exceeding that of the 16th. September by 22 % in grain yield and 33 % in straw yield. On the other hand, late sowing (30th. September; 14th. October in 1916 and 1917) always gave inferior results.

These data show that, at Alnarp, the most favourable time for sowing wheat is towards mid-September. This, naturally, varies for other agronomic and climatic conditions; for example, in places higher and colder than Alnarp, the best date is from the 5th. to the 10th. of September, whereas, in Skåne (southern Sweden), the most satisfactory time for sowing is at the end of September or during the first half of October.

RYE. – Variety tested: – "Stjärnråg". Dates of sowing: – 2nd. 16th., 30th. September and 14th. October.

The following table shows the yields in grain and straw obtained during the 4 years 1914-1917.

	Date of sowing			
	2nd. Sept.	16th. Sept.	30th. Sept.	14th. Oct.
Yield in grain per acre	36 cwt	34 cwt.	31 cwt	26 cwt
Yield in straw per acre	61 »	59 »	52 »	46 »

The most favourable date for sowing rye is, therefore, the 2nd September. The yields in grain and straw decrease with the lateness of sowing, until, for the 14th October, they reach a minimum of 26 and 40 cwt. respectively.

The date of sowing influences the quality of the crop, both in the case of wheat and in that of rye.

Experiments to determine the most favourable time for sowing in the various districts would, therefore, be of great value.

150 - **Cultural Experiments with Different Varieties of Oats in Norway.** — KNUT WIK, in *27de Aarsberetning (for 1915-1916) om Norges landbrukshøiskoles Akerekstensøk*, Christiania, 1917.

This paper gives the results of cultural experiments made in 1915 and 1916 with 40 varieties of oats, amongst which were largely represented the best types created at Svalöf, which have rapidly spread throughout the Scandinavian countries. These are: — Guldregn, Kron, Leger, Ligowo II, Dala, Klock I, and Klock II, Stormogul, etc. Then come: — Grenadier, Odin and Thor, Norwegian varieties produced by W. CRISTIE, two Danish varieties, Tystofte Gulvid and Gul Naesgaard; and the varieties Strubes, Schlanstedter, Waverley, Storm King, Tartar King, as well as the native local varieties.

Grain yield. — Klock II gave the best results in this respect, but the fact that it is black is prejudicial to it in Norway, where white or yellow oats are grown exclusively.

There are better prospects for Guldregn, a white oat, whose 2nd. place in grain yield has been confirmed by the experience of many years and more than 200 cultural experiments.

The varieties Leger and Kron also give a good grain yield but are too late to be grown advantageously in Norway.

Straw yield. — In this respect Stormogul is superior to all the other varieties and is the best type of fodder oats.

The Norwegian varieties, Odin and Grenadier may compete with Guldregn, but only in very favourable environmental conditions.

The Thor variety, remarkable for its earliness, gives a higher yield than the native varieties, which it might, perhaps, replace.

The Danish oats, Tystofte Gulvid and Gul Naesgaard are, on the average, inferior to the Guldregn variety.

151 - **Varieties of Maize for Grain and Green Fodder Recommended by the Department of Agriculture for New South Wales.** — *The Agricultural Gazette of New South Wales*, Vol. XXVIII, No. 8, pp. 559-562, Sydney, August 1917.

A conference of Inspectors of Agriculture was held in Sydney lately for the purpose of discussing the work in connection with the Farmer's Experiment Plots. The following recommendations (see p. 1219) were made for the growing of maize throughout the State:

Summary of the recommendations.

Variety	Use	District and Time of Sowing
Boone County White . .	Grain	South Coast (for main crop, October sowing, as for rich soils or for low moist situation).
Early Clarence	Grain	Tumut District.
Early Yellow Dent . . .	Grain	Northern Tableland, North-Western Slopes (for La cember sowing if necessary), Western Slop (only September or December sowings recom mended).
Funk's Yellow Dent . . .	Grain	South Coast (for early crop, September to Novem ber sowing), Central Tableland, North Weste Slopes (for October or November sowing), Wes ern Slopes (only September and November s wings recommended), Tumut district, Murrum bidgee Irrigation Area (only December sowin recommended).
Hickory King	Grain	North Coast (on poorer or upland soils), Centr Coast (for poorer or upland soils), South Co (for early crop, September to November sowin and for poorer or upland soils).
	Green Fodder	South Coast (for poorer or upland soils), North Tableland, Southern Tableland (for early matu ing crop).
Improved Yellow Dent. .	Grain	North Coast (for late sowing or main crop, Oct to December sowing), Central Coast (ma crop, October to December sowing), South Co (main crop, October sowing).
	Green Fodder	North Coast, Central Coast, South Coast (for l tile soils), Southern Tableland (for late mat ing crop), North Western Slopes, West Slopes, Tumut district, Murrumbidgee Ir Area.
Leaming	Grain	North Coast (most suitable for early sowing, S ember to November), North Coast (Dorrigo Comboyne Tablelands), Central Coast (for ea crop, September and October sowings), Tum district.
	Green Fodder	Northern, Central and Southern Tableland early maturing crop), Western Slopes.
Red Hogan.	Grain	Central Coast (main crops, September to No ber sowing), South Coast (main crop, Oct sowing.)
Reid's Yellow Dent . . .	Grain	North Coast (Dorrigo and Camboyne Tableland
Silvermine	Grain	South Coast (for early crop, September to Nov ber sowing), Central Tableland Western Sl (only September or December sowings re mended), Murrumbidgee Irrigation Area December sowing recommended).

Approximate Order of Maturity, of the varieties recommended by the Department:

Early	Early Yellow Dent
Medium Early	Silvermine Funk's Yellow Dent Reid's Yellow Dent
Mid Season	Hickory King Boone County White Learning Early Clarence
Medium Late	Improved Yellow Dent
Late	Red Hogan

The maize districts for yield purpose of these recommendations were classified as follows: North, Central and South Coast, Northern, Central and Southern Tableland; Northwestern and Western Slopes, Tumut District and Murrumbidgee Irrigation Area.

The following varieties are being further tested by the Department:

Gold Standard Learning	Hildreth
Goldmine	Hiawatha
Yellow Moruya	Kansas Sunflower
Giant White	Whitecap Horsetooth
Yellow Mastodon	Prairie Queen
Golden Nugget	Chester County

The recommendations are summarised on page 1218.

152 – **Maize Growing in Utah, U. S. A.: Irrigation and Manuring.** — See No. 1125 of this *Review*.

153 – **Effect of Removing Blossom on Yield of Potatoes.** – *The Gardeners' Chronicle*, Vol. LXII, No. 1619, p. 178. London, November 3, 1917.

Among the experiments carried out during the present year by Messrs. Sutton & Sons at Reading, those relating to the effect of the removal of the blossoms on the yield of potatoes are of special interest.

The following table gives the results in detail and from it will be seen that, in five out of seven plots experimented upon, picking of the blossoms resulted in an increased yield, and that the average increase was by no means negligible, amounting to 215 lbs. or an increase of 5 per cent.

Blooms Picked v. Not Picked.

	Picked			Not Picked		
	cwt.	qr.	lbs.	cwt.	qr.	lbs.
Plot 2	4	2	1	5	0	3
Plot 4	5	2	10	4	2	1
Plot 6	5	3	0	5	0	20
Plot 8	5	2	9	5	0	7
Plot 10	4	2	20	4	1	26
Plot 12	5	2	20	5	1	8
Plot 14	4	3	4	5	0	10

1154 – **"Capim jaraguá" (*Andropogon rufus*, Kunth), a Brazilian Fodd Plant.** – CORRÊA, M. P., in *Lavoura e Criação*, Year 2, No. 2, pp. 28 to. Rio de Janei February, 1917.

This grass, whose roots are almost rhizomes, whose stem reach a height of nearly 10 feet and whose narrow leaves reach a length 6 ½ feet, is perennial and early even during the rainy season. It is sistant to heavy and continuous rains, to intense heat and, sometim even to slight frosts, but cold is very detrimental to it, and may ev destroy it entirely.

In central Brazil (Piauhy, Goyaz and Matto Grosso) it is one of t principal fodder plants, and might, perhaps, be advantageously gro from São Paulo to the extreme north; it has even been introduced i

Analysis of the grass as sowi[illegible] of Andropogon rufus.

	Before flowering	In flower	After flowering
Grass:			
Water	72.80 – 77.91 %	72.85 %	65.61 %
Nitrogen	1.29 – 2.75	1.61	1.09
Fat	0.46 – 0.86	0.33	0.40
Nitrogen free extract	9.56 – 9.75	10.78	14.83
Fibre	8.00 – 9.50	11.22	14.50
Ash	2.59 – 4.53	3.21	3.57
Hay:			
Water	60.72	30.40	10.12
Nitrogen	3.20 – 5.78	3.85	4.66
Fat	0.66 – 1.01	1.91	1.41
Nitrogen free extract	26.71 – 33.82	27.09	40.42
Fibre	21.33 – 30.92	28.49	—
Ash	9.52	7.86	7.71

	Grass	Hay	Hay made at flowering
Percentage composition of ash:			
Silicic acid	39.34 – 60.70 %	62.56 %	60.52
Sand	19.20 – 39.15	3.39	11.97
Potassium oxide	7.81 – 11.62	17.83	7.55
Calcium oxide	1.04 – 3.08	4.65	7.50
Phosphoric acid	0.56 – 0.93	1.89	

	Grass	Hay of plants in flower	Hay made at flowering
Digestible nutrients (in per cent. of the dry matter):			
Nitrogen	2.23 – 7.08 %	5.00 %	3.02
Fat	0.69 – 1.75	0.81	1.02
Nitrogen-free extract	27.78 – 34.90	39.95	35.53
Fibre	24.12 – 29.07	26.32	27.37
Food value ratio	1 : 4.5 – 1 : 7.3	1 : 5.1	1 : 6.0 – 1 : 1

tral America and the Antilles. It is not advisable to grow it in thern Brazil, although it would do well there for pasture if mown or zed while still tender, that is to say, from the beginning of flowering, or n after. As the plant is very juicy, it lives for many months, thus pre- ting the burning of pasture-land, carried out in Brazil to renew the grass, n having the desired effect — the total destruction of the plant. The lt is that the woody stems become pointed and wound the muzzles the animals when they graze the first growth the following year. To id this the ground should be regularly mown or ploughed and re-sown.

The best method of utilising this plant is to make hay of it, cutting hen it has reached a height of about 2 to 3 feet. In heavy soil an aver- of 3 or 4 cuts a year may be made (in some soils as many as 6), in sandy s 2 or 3. Good, fresh soils yield 120 tons of grass per acre, which gives ons of hay; poor, sandy soils yield 38 tons of grass and 14 tons of hay acre.

Analyses made at the "Istituto Agronomico" of Compinas gave the lts shown in the appended table.

The hay, which is especially rich in potash (2.1 %) and lime (0.545 %), relatively poor in phosphoric acid (an average of 0.021 %), is not ourable to milk production, but is excellent for fattening and as a main- ance ration.

This plant is known in Brazil under the various names of "Capim acuá", "Capim provisorio", "Capim vermelho" (at Goyaz), "Cantin- ho roxo", "Sapé gigante" (at Matto Grosso). In Colombia and at to Rico it is called "Yaguará"; in the Dominican Republic it is known "Zacaté de jaraguà".

— **The Cultivation of Flax in the French Colonies of North Africa.** — DYBOWSKI, J. *Comptes Rendus des Séances de l'Académie d'Agriculture de France*, Vol. 3, No. 31, pp. 961-967. Paris, October 17, 1917.

In view of the rapid decline in the cultivation of flax in France, and the increasing need for flax fibre (a need accentuated today by military urements), the author (professor of the National High School of Colo- Agriculture) shows the advantages of developing the cultivation of these ts in the French possessions of North Africa.

The cultural experiments in Tunis and Morocco are encouraging and give interesting results. Up to the present this plant has been cultivat- n Tunis exclusively for its seed, and the quantities obtained were 634.65 s in 1911, 1730.70 tons in 1913, and 1268.10 in 1915. The amount of obtained is still more interesting; in Tunis the yield is from 5.57 to cwt of seed per acre, and three times that amount of straw. This straw f inferior quality because sown too thinly (53 lbs. per acre); as a result flax becomes branchy. About 178 lbs. per acre should be sown.

The objection raised is the lack of water for retting on the spot, but objection falls through if PEUFAILLIT's method (1) is used, as this s not require more than 141 to 176 cubic feet of water per ton of straw.

(1) See B., 1915, No. 429.

1156 - **The Sugar Beet in the La Plata District (Argentine and Uruguay).** — ING, in *Anales de la Sociedad rural Argentina*, Year LII, Vol. 41, No. 6, pp. [illegible] Buenos Aires, August, 1917.

The cultivation of the sugar beet has developed in the Argentine result of the law of April 1906, which awarded money prizes, from year up to 1910.

A sugar factory using beets was established at Sierra, departm of Maldonado; and both the results of cultivation and the products obta were completely satisfactory. In 1910, the production varied between 1 and 11 metric tons of roots per acre; one grower obtained an excepti yeld of 30 tons per acre. The roots contained an average of 16 % of su but the factory only extracted an average of 10.17 %, owing to the us inefficient machinery.

In Uruguay, the Agricultural Laboratory of Sayago carried out exp ments in sugar beet growing during a series of years in which the clim conditions were very variable; these experiments always gave good yi per unit. The varieties grown at Sierra were; — "Dieppe (Fren "Wohanka" (Austrian) and "Kleinwanzleben" (German), as wel many other varieties received from the United States Department of culture: Schreiber special, Brenstedt, Henry Mette, Kleinwanzleben, Dic Braune. The soil of the experimental plot was rather compact; it was manured and was worked as little as possible. The results obtained in are given in the appended table. The commercial yield is calculated o basis of a 13 % extraction. The last column gives the sugar conte the stock plants which are being selected at Sayago; some have as mu 19 % of sugar. As stock plants were chosen those whose roots cont more than 15 % of sugar.

Production of sugar beets and average sugar content of the stock p selected. Experiments carried out at the Agricultural Laboratory of Sa Uruguay.

Variety	Roots chosen cwt. per acre	Sugar produced cwt. per acre	Commercial yield of sugar cwt. per acre	Av su co fo ju
Dieppe	241.84	44.02	31.43	
Wohanka	252.00	43.34	33.75	
Schreiber special	267.43	45.57	34.00	
Brenstedt	268.96	49.75	45.01	
Henry Mette	135.94	21.90	17.68	
Kleinwanzleben (U. S. A.)	282.84	45.25	36.70	
Dieppe (U. S. A.)	235.87	39.39	30.60	
Braune	216.77	34.20	28.17	

1157 - **The Irrigation of Sugar Beets.** — HARRIS, F. S., in *Utah Agricultural Ex Station, Bulletin* No. 156, pp. 24 + 14 figs. Logan, Utah, June, 1917.

In the United States the beet sugar industry has proved to be successful and has found its greatest development under irrigation; it

est of the sugar beets of the country are now produced with the aid of rigation water. The expense of raising an acre of beets is, however, so reat that every condition should be as favourable as possible in order to revent losses. Unless the soil and moisture conditions are favourable it impossible to get a crop of sugar beets sufficiently large to pay the cost production. The cost of raising an acre of grain is relatively low, and the crop is poor the loss is slight ; with beets the farmer cannot afford to ave a failure. These conditions make it especially desirable to understand e w.ter requirements of the sugar beet plant.

The writer reviews the literature on the irrigation of beets with refer-ce to twenty works by various authors.

The experimental work was conducted on a well-drained uniform clay am which was manured every year and was autumn-ploughed except one ar when storms made it necessary to wait till spring. The land was anted alternately to beets and potatoes. The soil will hold a maximum about 22 per cent. of moisture under field conditions. The plats were 30 58.08 feet, or $\frac{1}{10}$ of an acre each exclusive of a 7-foot space between e plants. The water was taken to the land in wooden flumes, where it as given to the beets by the flooding method. All the water was retained the plats by banks around the edges. To a number of plats water was ded each week during the growing season, but the time of applying ater to most of the plats depended on the stage of development of the ants. The sugar beet plant was divided into four stages as follows: just before thinning time; 2) four weeks after thinning; 3) when the beets eraged two inches in diameter; 4) when the beets were nearly, but not ite, ripe. A five-inch irrigation was used as a standard at these stages. n application of this amount was given at each stage, at each two stages, each three stages, and at all the four stages, thus giving quite a number different combinations. It is possible, therefore, from the results obtained, determine which stages are best when either one, two or three irrigations e used. In the weekly irrigations one plat received one inch, another 5 inches, another 5 inches, and another 7.5 inches of water each week ring the regular irrigation season. The experiment was begun in 1912 d carried through 1913, 1914, 1915, and 1916, giving five years' results. nditions during these years were made as uniform as possible in every spect. The record of precipitation during the first four years averaged arly 18 inches a year.

When the beets were watered each week during the growing season, one ch of water weekly gave a higher yield than did more than this quantity; t when one irrigation was given it was most effective when applied at the ne the beets averaged about two inches in diameter.

Irrigating the land after the seed was planted and before the plants were roduced the yield below that where no irrigation water was applied. The st desirable time to apply water after the plants had begun to grow was t before the beets were ripe. When the water was applied at the proper ne, two or three irrigations of five inches each gave practically as good sults as where more water was used.

Proportionately more tops were produced by the high and the la irrigations than by the opposite conditions. The percentage sugar a the purity were higher in the irrigated than in the non-irrigated beets, e cept where the irrigation water was added very late. The highest percenta of sugar resulted from irrigation water applied when the beets were about t inches in diameter.

Contrary to popular opinion, the length of beets was not increased delaying the time of applying the first irrigation. The percentage forked beets bore no consistent relationship to the amount of irrigat water applied. Irrigation water affected the average size of beets in pr tically the same manner that it affected the total yield.

To sum up, sugar beets do not require large quantities of irriga water if it is properly applied, but they are sensitive as to the time i given.

1158 – **Sugar-Beet from Locally-Produced Seed, in France.** — See No. 1141 of *Review*.

1159 – ***Stevia Rebaudiana* Bert., a Saccharíferous Plant of Paraguay.** — JUAN, in *Revista de la Escuela de Comercio*, Year 3, Nos 32 to 37, pp. 633-636. Asse tion, January-July, 1917.

This plant was described in 1899 by Dr. MOISÉS S. BERTONI under name of *Eupatorium Rebaudianum* Bert. n. sp. (*Revista de Agronom* Escuela Nacional de Agricultura de Trinidad, Vol. II, No. 1, p. 35); later referred it to another genus, under the name of *Stevia Rebaudiana* Bert. (*Anales científicos paraguayos*, No. 5, December, 1905). In Paraguay i commonly known as " kaá-héé " or " yerba dulce ", a name due to the traordinary sweetening capacity of its leaves and branches. It grows w but in small quantities only, in the districts near the Amambay sierra far as the river Monday. It has been frequently analysed. DIETE (*Pharm. Centralblatt*, 1909, Vol. 50, p. 435) found in it two glucosides, w he called " Rebaudine " and " Eupatorine ", and which had a sweete capacity from 150 to 180 times greater than that of saccharose (2).

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(1) Species admitted by the Index Kewensis — *S. Rebaudiana* Hemsl., in HOOK. f. *Flora Plantarum*, 2816 (1906) Parag. — *Index Kewensis Plantarum Phanerogamarum*, S *mentum quartum*, p. 227, Oxonii, 1913.

(2) *C. Rebaudianum* Bert. Saccharíferous plant of Paraguay (" Kaá-Hé-É "). Sweet rica. All its parts have a marked sweet taste. Its leaves contain: 20-26 % of tannin; a glucosidic, crystalisable, red substance, probably $C_{42}H_{72}O_{21}$, not identical with glyce which may be broken up into glucose and a substance $C_{30}H_{40}O_5$, with an apparently character); a second sweet substance, " Rebaudine " (perhaps a sodium or potassium com of the preceding sweet substance, called " Eupatorine ") containing 10-11 % of ash; th substances have a sweetening capacity 150-180 times as great as that of sugar; a wax melts at 57.5°; a fatty sodium substance melting at 56°; a resin, melting at 65-68°; a amorphous, hygroscopic substance melting at 50°. The sweet crude substance extracte the plant contains all these substances (C. WEHMER. *Die Pflanzenstoffe, botanisch matisch bearbeitet, Phanerogamen*, p. 762. Jena, Fisher, 1911). (Ed.)

Rather than being used in competition with sugar, cane and beet, s plant may be used commercially for the preparation of medical infu- ns; mixed with tea, maté, and similar leaves it would give a sweetened ink and would serve as a harmless substitute for saccharine in prepara- ns for diabetics, etc. The first necessity, however, is to cultivate the ant, and here a difficulty arises. The author's experiments have shown at it does not grow easily from cuttings, and that, as a rule, it is not re- oduced from seed. In the wild state, however, there are many varieties, me of which are reproduced from seed; it would, therefore, be possible select a fertile variety. The author has studied this subject and found an sy and sure method of reproduction. He has a plantation at "Quinta", Esperanza, Puerto Bertoni, Paraguay.

60 - **The Fermentation of Philippine Cacao.** — FREL. HARVEY, C., in *The Philippine Journal of Science*, Vol. XII, Section A, No. 1, pp. 1-15, Manila, January, 1917.

The results of a census made by the Philippine Bureau of Agriculture ve shown that, while only a few of the provinces raise more cacao than ough for local consumption, there are cacao trees in nearly all of them. conclusion is reached that the Philippine Islands can grow cacao in large antities and become important as a cacao-producing country, all the since the general consumption of this article exceeds its production. average increase in per cent. consumption for the 5 years 1908-1912, ed on the 1908 consumption, is 24.9 while the increase of production only 11.6 per cent.

In the Philippines, the methods of preparing cacao are very crude, no conscious effort is made to ferment the beans. The latter are dried the sun, without any preliminary treatment, for 3 to 6 days. They are y rubbed between the hands with ashes, or rice husks, to remove the previous to being placed in the sun, or else mixed with rice hulls and den under foot. Then they are washed to remove the pulp and finally sed to the sun. The writer has long urged the necessity of fermenting ao, and his opinion is endorsed by most, if not all, experts.

The provinces of Pampanga and Hoilo are the chief centres of cacao duction in the Philippines. Two varieties are grown: "criollo", the st, and "forastero" of very fair quality. Sixty samples of each of se varieties were examined by the Bureau of Science; the data obtained e set forth in the following table.

Average weight of fruits and seeds of Philippine cacao.

Weight of fruits			Weight [illegible] seeds			Weight of seeds in % of weight of fruits		
maximum	minimum	average	maximum	minimum	average	maximum	minimum	average
481 g	130 g	281 g	116 g	42 g	61 g	38.1	14.14	24.6
531	190	355	178	65	99	38.2	17.7	27.9

The writer carried out some fermentation experiments with these varieties of cacao, and compared the analytic data obtained for them those obtained from a number of foreign cacaos. He concluded that Philippines can grow a good quality of cacao in large quantities, and t the time seems opportune for such an innovation.

A study of "criollo" and "forastero" cacao fermented during vary lengths of time, and the study of the respective influences of enzymes a yeasts, have led the writer to the belief that the fermentation is the j result of the reaction of yeasts and of enzymes.

1161 – **The Cultivation of the Sweet Cinnamon Tree (*Cinnamomum Burma* Blume) in Sumatra.** – WYERS, E. W., in *Teysmannia*, Year 28, Pt. 1, pp. Batavia, 1917.

Cinnamomum Burmanni is grown in Sumatra by the natives and certain plantations belonging to Europeans on the western coast of the isla

The tree grows in all soils, but does best in those which are deep, meable and rich in humus, and at heights varying between 2000 and feet. It is usually grown from seed in nurseries. At the end of 6 mon the trees may be transplanted about 13 × 13 feet apart. Occasionally natives use adventitious buds or young plants which have appeared a dentally in the plantations, but nursery seedlings are to be preferred. the seeds loose their germinating capacity in about two weeks, they m be sown immediately after harvest. The plantation must be hoed repeate to prevent the growth of weeds. After 4 years, one hoeing is su cient. After 10 years the harvest may be gathered. The trees then h an average circumference of 3 ¼ feet; their regular growth is largely pendent on the situation and the composition of the soil, but it may much injured by careless cultivation.

For the harvest, the superficial layer of the bark is removed by scra to a height of 6 ½ feet; the bark is then cut in strips about 3 ¼ feet l and ¼ foot wide (at the base). When all the bark of this surface has b removed the tree is felled and the bark removed from the rest of the trun the same way. The branches and twigs give a bark of 2nd. or 3rd. qual

After cutting, the bark is dried; at the end of three days that w has dried sufficiently has rolled into the tubes well known on the mar

"Djamoer oepas" (*Corticum javanicum*) is the most important dis attacking cinnamon. Insects sometimes eat the leaves. A parasitic nerogamous plant of the genus *Loranthus* is sometimes found on the twi

The net profit of a cinnamon tree plantation at the end of 10 yea estimated at £ 15 per acre. The natives frequently mix the bark of tree with other similar barks, thus greatly decreasing the value of the duct.

The cinnamon is re-sorted by the merchants, who divide it into qualities, the value of which, on the local market of Padang, varies betw £ 3. 3. 6 and £ 4. 12. 9 per *picol* (1 35.34 lbs.). The bark is shipped in of from 66 to 88 lbs.

1162 – **The Improvement of Hops by Crossing and Selection, in England.** – No. 1142 of this *Review*.

[illegible] – Experiments in the Cultivation of Medicinal Plants at the Agricultural Station of Bezentchuk, Russia, in 1916. – КОЛЕСНИКОВ, І. (Куальницкій Я.) in *The Agricultural Gazette* (*Земледѣльческая Газета*), No. 3, pp. 71-75; No. 4, pp. 94-96; No. 5, pp. 119-121. Petrograd, 1917.

The syllabus of the Bezentchuk Agricultural Station has, since the spring 1916, included experiments on the cultivation of medicinal plants. They re undertaken to study: 1) the local wild medicinal flora; 2) the possi- ity of cultivating the wild species; 3) the modifications caused in them by tivation; 4) the introduction of species which do not exist in the district.

In a radius of about 40 miles the following species were found: *Adonis vernalis* — *Anemone Pulsatilla* — *Melilotus officinalis* — *albus* — *Tanacetum vulgare* — *Chelidonium majus* — *Cichorium Intybus* *Solanum Dulcamara* — *Mentha arvensis* — *Origanum vulgare* — *Thy-* *Marshallianus* — *Fumaria officinalis* — *Malva borealis* — *Hyperi-* *perforatum* — *Rhamnus cathartica* — *Carum Carvi* — *Tussilago Farfara* *Achillea Millefolium* — *Artemisia Absinthium*, *A. procera*, *A. vulgaris*, *scoparia*, *A. incana* — *Taraxacum officinale* — *Hyoscyamus niger* — *atura sanguinea* (?) — *Capsella Bursa-bastoris*.

This list is not complete because seeds of other wild species which will sown another year were also gathered.

In view of the large number of species found, the plots devoted to each e about 1 square yard in size; perennial species alone took up 59 square ds. Phenological observations were carried out during the growth of plant; all the different phases of development, from germination to turity, were noted: date of sowing; date of germination; appearance of first leaves; appearance of the floral buds; flowering; formation of the it; maturation.

When picked the plants were dried in order to determine the percen- e of dry matter. When there was a sufficient quantity of material, the ount of the principal medicinal substance yielded by a given plant was o determined. Below are the results of the determinations of essential s obtained by distillation with steam, in percentage of the dry matter.

Essential oil content of various species.

[illegible] *Dracocephalum*, during flowering	
incana	
procera	
marginata	
scoparia	
Dracocephalus	
vulgaris	
paniculata	
officinalis	
Marshallianus	
Serpyllum, before flowering	
vulgare, during flowering	
officinale, after flowering	
piperita (leaves), before flowering	
piperita (peduncles), before flowering	
sativa var. *indica*, during flowering	
Chamomilla, during flowering	
sativum, unripe seeds	

Certain data were also obtained on the yield in seed of certain spec per square metre (1.19 sq. yards). Thus *Calendula officinalis* gave 80 gr *Cnicus benedictus*, 54 grms., *Coriandrum sativum*, 56 grms., *Nigella sat* 23 grms. and *Datura Stramonium*, 383 grms.

1164 – **Officinal Plants of South Australia and Their Uses.** — OSBORN, T. G. B., in *Journal of the Department of Agriculture of South Australia*, Vol. XX, No. 12, pp. 9[illegible] Adelaide, July, 1917.

The flora of South Australia (and indeed of the whole of Austral contains very few officinal plants. The nineteenth edition of Squire's Co panion to the Pharmacopoeia (1916) gives the following for Australia: *A cia decurrens* (bark, for tannin); *Alstonia constricta* (bark, aqueous extr for bitter principle); *Eucalyptus globulus, E. amygdalina, E. cneorifolia,* e (leaves, oil); *Mallotus philippinensis* (gives the drug "kamala"). Of th plants only the *Eucalyptus*, and possibly *Acacia decurrens*, are natives South Australia.

Other indigenous drug plants are given by MAIDEN in his *Useful Na Plants of Australia*; few in the list belong to South Australia. The follo ing are, however, natives of that country:

Adiantum aethiopicum (maidenhair fern). — Slightly astringent and a matic.

Codonocarpus cotonifolius (quinine tree, medicine tree, horse-rad tree). — Bitter principle, but quite different from quinine.

Cymbonotus Lawsonianus. — Extracts of leaves with lard, used a salve.

Duboisia Hopwoodii ("pituri"). — Used for chewing; has an into cating effect.

Epilobium tetragonum (native willow herb). — Diuretic.

Erythraea australis (native pink centaury). — Infusion used as a to

Hardenbergia (*Kennedia*) *monophylla* (native lilac). — Used as sa parilla. MAIDEN says the virtues attributed to it are imaginary.

Hydrocotyle asiatica. — Used in India for skin diseases.

Justicia procumbens. — Used in India for ophthalmia.

Melaleuca uncinata (tea tree). — Leaves chewed for catarrh.

Mentha gracilis (native pennyroyal) and *M. saturcioides*. — Regul ing menses.

Mesembryanthemum aequilaterale (pig face). — Astringent propert

Myriogyne minuta (syns. *Centipedia orbicularis* and *Cunninghamii*). Ophthalmic.

Portulaca oleracea. — Antiscorbutic.

Pteridium aquilinum (bracken). — Vermifuge.

Sarcostemma australe. — Milky juice used on wounds.

Sebaea ovata. — See *Erythraea* above, to which it is related.

Typha augustifolia (bulrush). — Rootstock used in Eastern Asi dysentery, gonorrhoea and measles.

The following plants which are naturalised weeds in South Austr appear in the British Pharmacopoeia:

Anthemis nobilis (common camomile). — Flower heads.

Conium maculatum (hemlock). — Full-grown, unripe fruits.

Datura Stramonium (thorn apple). — Dried leaves and ripe seeds.

Mentha piperita (peppermint). — Oil distilled from fresh flowering plants.

Ricinus communis, *Rosmarinus officinalis*, *Taraxacum officinalis*

1175 **The Genus Strychnos in India and the Far East.** — HILL, A. W., in *Royal Botanic Gardens Kew, Bulletin of Miscellaneous Information*, Nos. 4 and 5, pp. 121-210, figs. 20. London, 1917.

Owing to the difficulty of arriving at a satisfactory determination of some specimens of *Strychnos*, sent to Kew from the Philippine Islands and from Amboina, it seemed advisable to re-examine the plants from Malaya generally, and this led finally to a general revision of the genus in India and throughout the East. As a result twenty-two new species and some new varieties have been described. Two species usually regarded as synonyms have been restored and one species has been excluded.

The present account is far from exhausting our knowledge of the genus in the East, as there is good evidence of several species in Siam, Cochin-China, Borneo, the Philippine Islands, etc., which are represented in herbaria by leaf specimens only, and have not yet been described. Ninety-three species of *Strychnos* have now been described from India and the East by various authors, but as one of these is excluded in the present account the actual number of well-authenticated species in this region is really ninety-two. The Author's classification is as follows:

BREVITUBAE: *S. paniculata* — [illegible] — *Vanprukii* — *tetragona* — *Maingayi* — [illegible] — *villosa* — *lanceolaris* — *hirsutiflora* — [illegible] — [illegible] — *hypogyna* — *andamanensis* — [illegible].

[illegible]: *S. flavescens* — *cinnamomiphylla* — [illegible] — *Forrestii* — *laurina* — *similis* — *hastata* — *potatorum* — *flavescens* — *angustiflora* — *coriacea* — *polytrichantha* — *dubia* — [illegible] — *micrantha* — *colubrina* — [illegible] — *Merrillii* — *pictinervia* — [illegible] — *multiflora* — *Curtisii* — *lanata*.

[illegible]: *S. Benthami* — *quadrangularis* — *pubescens* — *Ridleyi* — *Robinsonii* — [illegible] — *axillaris* — *Schmidtii* — *armata* — *plumosa* — [illegible] — *arborea* — [illegible] — *Dalzellii* — *malaccensis* — *penicillata* — *Wenzelii* — *Teijsmannii* — *Horsfieldiana* — *palembanica* — *luzonensis* — *impressinervis* — [illegible] — [illegible] — *melanocarpa* — [illegible].

[illegible]: *S. angustiflora* — *Nux-vomica* — *Nux-blanda* — *lucida* — *cinnamomifolia* et var. *Wightii* — *tubiflora* — *rupicola* — *Pierriana* — *Wallichiana* — *Spireana* — *cuspidata* — [illegible] — *Ignatii* — [illegible] — [illegible].

[illegible] non satis notae: *S.* [illegible] — [illegible] — *Gautheriana* — [illegible] — *tesseroidea* — [illegible] — [illegible] — *Thorelii* — *polyantha* — [illegible] — [illegible] — [illegible] — [illegible] — *Koordersii* — *Bancroftiana*.

Economically, the two most important species dealt with are *S. Nux-vomica* and *S. Ignatii*, on account of the strychnine and brucine contained in the seed. The seeds of *S. lucida*, *S. cinnamomifolia*, and possibly other species, also contain a fair percentage of alkaloids, but there is no evidence that they have been commercially exploited. The bark of *S. Gautheriana*, Pierre, known under the native name " Hoang Nan ", is said to be very efficacious in cases of leprosy and also to be employed by the

natives in Tonkin as an antidote for hydrophobia. *S. colubrina* fro S. India has been in repute from early times, under the name "lignu colubrinum", as a specific for snake bite, and it is also used as a tonic i dyspepsia and malaria by the Hindus, no doubt on account of the stryc nine contained in the wood of the root. This alkaloid also occurs in th wood and bark of *S. Nux-vomica*, and possibly of other S. Indian speci and it is probable that the products of more than one species of *Strychn* pass under the name "lignum colubrinum". RUMPHIUS'S *Arbor leg colubrini* is *S. ligustrina*, a species quite distinct from the Indian plan The bark of the root of *S. Ticuté* also contains strychnine, and yields th poison known in Java as "Radja" or "Ticuté". The bark of the roo of *S. quadrangularis*, Hill, from Perak, is used as an arrow poison by th Sakais, and strychnine no doubt also occurs in the root bark of *S. o lifolia*.

The pulp of the fruits of *S. Nux-vomica* is readily eaten by birds a also by monkeys in India though it contains some strychnine, and th Shans are said by BURKILL to eat the pulp of the fruit of *S. Nux-bland* Hill, which is probably — like the seeds — almost free from alkaloid

The seeds of *S. potatorum* are well known for their property of clearin muddy water, and the fruit pulp is edible.

At least six of the species under consideration are trees, namely, *S. Nu vomica*, *S. Nux-blanda*, *S. potatorum*, *S. arborea*, *S. ligustrina* and *S. pol tha*. There is also probably, in addition to these, another tree in Queen land of which the wood only is known. The trees yield good timber whi is heavy and close-grained, and characteristically marked with white spo in transverse section (or white streaks in longitudinal section) due to patch of interxylary phloem.

Among the results of the present investigation perhaps the most i teresting is the recognition of the Burmese tree — previously referr to *S. Nux-vomica* — as a distinct and very definite species, the seeds which do not contain any appreciable quantity of alkaloid. *S. Nux vom* occurs in Ceylon, India extending to Bengal, and is also found in Fren Indo-China, while *S. Nux-blanda*, the new species, ranges from Manipu all through Burma to Siam and Cochin-China. Like *S. Nux-vomica* is a native of the drier regions and deciduous forests.

1166 – **The Use and Chemical Composition of the Seeds of *Hydnocarpus venenat H. alcalae*, and *Pangium edule*.** — PAUL C. HARVEY, in the *Philippine Jo of Science*, Vol. XI, Sect. A, No. 2, pp. 75-80; Vol. XII, Sect. A, No. 1, pp. Manila, March, 1916, January, 1917.

Owing to the inaccessibility of the regions producing the chaulmoo oil of commerce, obscurity envelops the source of this product which is use in the treatment of leprosy (1) For a long time it was supposed that th

(1) Chaulmoogra oil is one of the remedies most in vogue for leprosy, and one of the v few which, if they do not cure the disease, have arrested its progress for a long time, or ev entirely. These results are, however, rare, for they can only be obtained by an intensive u of the remedy and in this a great difficulty is encountered. The patient cannot bear the

il came from the seeds of *Gynocardia odorata*, but true chaulmoogra oil s obtained from the seeds of *Taraktogenos kurzii*, although the oil from the eeds of *Hydnocarpus Wightiana*, *H. anthelminticus* and *H. venenata* is probably often substituted for it. Oil from these last-named trees is nown as "kavatel" in Malabar, and is so similar in its properties to haulmoogra oil, that a distinction by chemical means is hardly possible. It is for this reason, that the writer has undertaken a series of investigations f the oils of other *Bixineae* similar to the genus *Taraktogenos*.

Hydnocarpus venenata. — The nuts, heated at 100° C. to destroy any enzymes present, and then dried, yielded 45.57 % of dry kernels. The latter gave by expression a yield of 51.18 % of oil. It properties, compared with thse of similar oils, are given in Table I. The presence of a cyanogenetic glucoside was detected in the press cake. Table I shows the chemical onstants of oils from *Taraktogenos kurzii*, *Hydnocarpus Wightiana*, *H. anthelminticus* and *H. venenata* to be similar, therefore their physiological properies should be identical; but the properties of *Gynocardia* oil may be different r not, according to whether the physiological activity is caused by the unaturated acids present in the chaulmoogra and *Hydnocarpus* oils, or by the lucoside present in all these seeds.

TABLE I. — *Constants of the oils from the seeds of Taraktogenos kurzii, Hydnocarpus Wightiana, H. anthelminticus, H. venenata and Gynocardia odorata.*

Constants	*Taraktogenos Kurzii* ("chaulmoogra")	*Hydnocarpus Wightiana*	*Hydnocarpus anthelminticus*	*Hydnocarpus venenata*	*Gynocardia odorata*
Melting point	22° C	22° C	23° C	20° C	Liquid at 20°
Specific gravity	0.951 at 25° C	0.958 at 25°	0.953 at 25°	0.948 at 30°	0.925 at 25°
Specific rotation	+ 52.0°	+ 57.7°	+ 25.5°	+ 52.03°	Inactive
Iodine value	103.2	101.3	86.4	99.1	152.8
Acid value	23.9	3.8	7.5	4.4	4.9
Saponification value	213	207	222	200.3	197
Refractive fraction	1.476	—	1.473	1.477	—
Characteristic glucoside	present	present	present	present	present
Chaulmoogric acid	do	do	do	do	absent
Hydnocarpic acid	do	do	do	do	do

Hydnocarpus alcala. — The fruits (nuts) examined came from Luzon

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ses of the remedy either administered through the mouth, or in the form of injections further, the latter are very dangerous, as they may produce death from fatty embolism). Dr. L. Stevenel, of the Laboratory of the Institute of Hygiene and Microbiology of Fort de France Martinique), has succeeded in preparing, with the collaboration of Dr. Noc, an emulsion of chaulmoogra oil in which the fat globules are smaller than the red blood corpuscles. Intravenous injections of this emulsion can be borne by patients. With regard to the preparation of this remedy, and the satisfactory results obtained with it, see *Bulletin de la Société de Pathologie Exotique*, Vol. X, No. 8, pp. 684-685, Paris, October 10, 1917. (*Ed.*)

(Philippines), where they are called " dudu dudu ". The oil and seeds a used there for dressing wounds.

Table II gives the chief results of the analysis of the fruits a their oil.

TABLE II. — *Characters of the Fruits and Oil of Hydnocarpus alcalae.*

A. — *Fruits.*

Average weight of fruits (diameter 20 × 15 cm.)	120 gm.
Shells	50.98 %
Seeds (numerous; diameters 4 × 2.5 cm.)	39.35 %
Water in seeds	60.50 %
Oil in dry seeds	65.50 %

B. — *Oil.*

	Oil	Free acids of oil
Melting point	32° C.	50° C.
Specific gravity at 30° C.	0.9502	0.9341
Specific rotation in chloroform	+ 49.65°	+ 53.05°
Iodine value (Hanus)	93.10	98.6
Acid value (NaOH N/10)	3.09	37.1
Saponification value	188.99	193.9
Index of refraction	1.4750	—
Reichert Meissl number	1.13	—

More than 40 % of the free acids consist of a compound possessi the same properties as the substance called by POWER chaulmoogric ac It has not been possible to isolate hydnocarpic acid, therefore it is cert that little or none is present in *H. alcalae*. Palmitic acid has been isolate but only traces of oleic acid found.

Pangium edule. — DE JONG has isolated from the leaves of *P. edule* cyanogenetic glucoside, similar to that isolated by POWER and others fro *Gyanocardia odorata* and called "gynocardine". The writer isolated it fro the seeds of *P. edule* and obtained it in the form of needle-shaped crystal of a golden yellow colour, melting at 166° C. He obtained 0.2-0.3 per cen of these crystals from the dry seeds of green fruits. Gynocardine diffe from other glucosides in its great stability in the presence of acid hydroly ing agents. The writer has isolated from the leaves of *P. edule* an enzym which he called "gynocardase" and which hydrolyses both gynocardine an amygdaline.

The oil obtained from the seeds showed the characters given in Tabl IV. It contains palmitic and oleic acid, as well as small quantities of a optically active acid, which may be hydnocarpic or chaulmoogric acid, o mixture of both. If this is the case, and if its power of curing leprosy due to the esters of hydnocarpic and chaulmoogric acid, it should b extremely easy to administer, seeing its low melting point. It is probabl however, that its action would be slow, for these esters are only found in

comparatively small amounts. On the other hand, the oil of *H. alcala* would be much more difficult to administer, because it is still solid at the ordinary temperature of Manila (30° C.)

TABLE III. — *Oil content of the Seeds of Pangium edule.*

	Ripe fruits	Green fruits
Content of the seeds of air-dried fruits (nuts)	42.67 %	36.38 %
Content of dried seeds in relation to the air-dried fruits	20.69	16.25
Oil content in relation to the dry seeds	21.66	24.11

TABLE IV. — *Physical and Chemical Constants of the Seeds of Pangium edule.*

Constants	Free acids obtained from the oil of ripe seeds	Oil of ripe seeds	Free acids obtained from the oil of unripe seeds	Oil from unripe seeds
cloud point	Cloudy at 18°C.	Slightly cloudy at 2°C.	—	No change at 8°C.
specific gravity	0.9013	0.9049	0.8955	0.9092
specific rotation in chloroform solution	+ 3.49	+ 4.28	+ 4.72	+ 20.65
iodine value (HANUS)	113.5	113.1	103.39	109.5
acid value (NaOH N/10)	36.7	0.52	34.2	0.90
saponification value	207.8	190.3	205.4	188.3
refractive index	1.4582	1.4665	1.4595	1.467

Fruit Nomenclature (Fourth Conference of the Pomological Committee of Australia, 1917). — PRESCOTT, E. E., in *The Agricultural Gazette of New South Wales*, Vol. XXVIII, No. 8, pp. 678-680. Sydney, August, 1917.

The following rules were considered as urgent by the Pomological Committee of Australia at its fourth annual Conference of Sydney (1917).

1) That the names shall be as simple as possible.

2) That wherever possible one word only should be used as a name.

3) Duplication of names, or names possessing strong similarity, is to be avoided.

4) That such words as "seedling" and "hybrid" be abolished from Australian Pomology as far as possible.

5) That priority of name, naming, or of origin, have preference wherever possible.

In order to have a uniform method throughout the various States of making description of fruits the following form was adopted:

Form for Describing Apples and Pears

THE POMOLOGICAL COMMITTEE OF AUSTRALIA

APPLES and PEARS

(Specimens and Information for Pomological Records).

SECTION I.

The accompanying specimens of . . . . . were obtained from Mr
Orchard . . . . . at . . . . . Grown on . . .
Average Annual Rainfall . . . . . .
Suggested Name . . . . . .
Origin . . . . . Age of tree . . . . . .
The original tree is still growing at . . . . . .
Age of tree from which samples were taken . . . . . .
Worked on . . . . . Stock . . . . . .
Habit of Growth. . . . . .
Description of Bark . . . . . Leaf . . . . .
Blossoming Date . . . . . .
Cropping Characteristics, ...
Date of Ripening. . . . . .
Keeping Qualities. . . . . .
Subject to what diseases or pests . . . . . .
Any other information . . . . . .
. . . . . .

Signed . . . . .

Date . . . . .

SECTION II.

To be filled at the Head Office.

Form . . . . . .
Size (in inches) . . . . . high . . . wide
Colour of skin . . . . . .
Dots, markings or russetts . . . . . .
Eye . . . . . Basin . . . . . .
Segments . . . . . .
Stalk . . . . . Cavity . . . . . .
Stamens . . . . . Tube . . . . . .
Core. . . . . Axile . . . . . Abaxile . . . .
Flesh texture . . . . . Colour . . . . . .
Flavour and quality . . . . . .
Used for dessert . . . . . Culinary . . . . .

1168 – **Production of Apples in West Colorado, U. S. A.** — See No. 121. *Review.*

109 - **Table Grape Hybrid Bearers.** — PEE-LABY, E., in *Revue de Viticulture*, Year 24, Vol. XLVII, No. 1217, pp. 261-263. Paris, October 25, 1917.

In view of the ever increasing difficulties met with by vine-growers in protecting their vines, such as *Chasselas*, *Muscat* and *Morterille*, which produce table grapes, from the attacks of cryptogamic diseases and insects, the author considers the question of hybrid bearers of table grapes. Among those recently created are some which might replace, even advantageously, the Chasselas and Muscats.

Girerd 157 has long proved its value in this respect. It has been particularly appreciated when Chasselas failed, and, some years, keeps as long. When picked when well ripened it is much sweeter than Chasselas, and its flavour is preferred by many. When grown from seed in a suitable exposure it gives very good grey-pink grapes. Grafted on the Rupestris du Lot, on 1202 and 3306, it gives much larger fruit than Chasselas. According to its exposure, Girerd 157 ripens simultaneously with or a little later than Chasselas. It is easily protected against disease by two treatments with sulphur and two or three with sulphate.

Seibel 5279 is at least 15 days earlier than Chasselas, and is less fleshy and sweeter. Its cylindrical bunches, sometimes with a small side bunch, remain hanging a very long time without rotting. This hybrid, which is very resistant to disease, requires no special care or treatment.

Seibel No. 2653 is still more palatable. On account of the appearance of its grapes it has been called "*Flot d'or*". It produces the prettiest table grapes there are, but is subject to "millerandage", which attacks it certain years. In 1917 it gave excellent results. Although attacked by mildew it is much less subject to this disease than Chasselas, or even Girerd 157. Two treatments with sulphate are adequate protection. So far it has not been found to suffer from oïdium.

The author considers *Seibel* 4752, which give grapes used in the vats, capable of producing table grapes as well. Its medium sized, longish bunches of loose, medium sized, round, yellowish grapes, ripen at the same time as, or a little later than Chasselas. It is an excellent grape, very sweet: in 1917, in the oenometer, it showed 13.0° of alcohol. In years such as 1917 it requires neither sulphate nor sulphur treatment.

As hybrids capable of giving a table grape with a musk flavour are mentioned *muscat Dumoulin* 290-35 *de Couderc* and 1897-12 *de Malègue*; they ripen about the same time as the preceding varieties.

A hybrid resistant to all diseases, which gives an excellent, very fine, very sweet, yellowish grape which can be left a long time on the plant, is 5455 *de Seibel*. This year, in the *Dujardin* oenometer the fruit of this hybrid gave 13° of alcohol. The foliage is immune to all disease.

110 - **Hybrid Direct Bearers in the Seine-et-Marne District, France, in 1917** (1). — SALOMON, RÉNÉ, in *Revue de Viticulture*, Year 24, Vol. XLVII, No. 1213, pp. 298-300. Paris, November 8, 1917.

The author gives the results of observations which, owing to the excep-

(1) See *R. Applied*, 1917, No. 733. (*Ed.*).

tional violence of mildew in 1917, he was able to make on his direct bearer as regards their resistance to this disease.

He affirms that every direct bearer which needs treating as a Vinifer should be rejected, but that, nevertheless, those which give a good yie must be kept, even if this can only be done by grafting and the harvest ca only be saved by two or three sulphate treatments, whereas ten will n always save the vinifera harvest.

The only treatment given the 60 varieties of direct bearers in the a thor's vineyard consisted of the first two sulphate sprayings.

Among these 60 varieties the following proved completely resista to mildew :

WHITE VARIETIES. — *Oberlin* 782, requires short pruning; rather liable to non-setting cold springs.

Couderc 272-60; young shoots which have not been trained and which trail on the grou have proved as immune as those which do not touch the ground; rather liable to non-setti in cold springs.

Seibel 845, fine clusters — *Seibel* 2710, requires strong stock.

Hoger, Noah variety with seed adhering to the pedicle.

PINK VARIETIES. — *Castel* 19,002, in cold, rainy seasons lignifies badly in the climate Paris.

BLACK VARIETIES. — *Baco* 24-23 No. 1.

Castel: 3 343, a little late for the climate of Paris; — 2 528, 4 001, 8 030, very stro planted in dry, warm soil, the fruit was gathered on September 1.

Couderc 7 120, too late for the climate of Paris; 7 104, 7 104, require strong sto

Bertille-Seyve 822, valuable in the north, although late, on account of the very late ce ing of its shoots.

Hybride Fournié, supposed by some to be subject to oïdium, proved absolutely immu to this disease without any treatment.

Gaillard-Girerd No. 2, slightly liable to non-setting in cold springs.

Oberlin 595, harvested on September 1.

Seibel: 128; —131, requires strong stock; — 2 744, fine vegetation, strong bunche 2 828, too liable to non-setting in cold springs; — 2 844, very strong.

In an experimental plot with eastern exposure, cold, marly, subje to frost and, after midday, shaded by high trees, left, moreover, purpos in an untidy condition verging on neglect, were planted 200 different varieti of all ages. Of these, the following proved absolutely immune to mild *without any treatment* :

WHITE VARIETIES. — *Oberlin* 782, the only one of the direct bearers mentioned a growing in this plot.

BLACK VARIETIES. — *Baco* 24-23, No. 1; *Bertille-Seyve* 822; *Gaillard-Girerd* No. 2; 595; the only direct bearers mentioned above growing in this plot.

Then :

WHITE VARIETIES. — *Bertille-Seyve* 485, shoots open late.

Seibel: 2 661, requires very long wood, rather liable to non-setting in cold springs; too late for the climate of Paris; — 4 792, irregular fertility; — 4 576, already recommen previously; — 4 574, 4 603, 4 681, 4 871, 5 023, yielded for the first time; their resistanc mildew and oïdium was noticed.

PINK VARIETIES. — *Seibel*: 1 075, first harvest; — 1 638, in late years its wood only ri with difficulty; complete non-setting in cold springs; annular incisions have an effect quit to that desired.

BLACK VARIETIES. — *Bertille Seyve*: 400, shoots open late; 872, first harvest; — 893, harvest in 1916 not very good; 1 129, first harvest.

Seibel: 4 565, wood ripens with difficulty in late years; complete non-setting in cold years; — 4 637, 4 658, too late for the climate of Paris; 4 696, first harvest.

71 - **The "Madone" Vine in the Department of Aude, France, in 1917** (1). — PÉGLABY, E., in *La Vie agricole et rurale*, Year 7, No. 46, pp. 334-336. Paris, November 17, 1917.

Wishing to know how the *Madone* variety did in 1917 the author (lecturer in the Faculty of Science of Toulouse) paid a visit on September 20 to Azens (Aude), where this vine had been found by M. ANGLES in the midst of a plantation of 128 Seibel. The fruit was ripe and ready to be gathered. On the hillsides, in the plain, grafted on to various stocks, and direct, the *Madone* always maintained its reputation, proving what might be called almost perfectly resistant to mildew and oïdium, and extraordinarily fruitful, too much so to give large grapes.

The weight of the bunches varied greatly, the averages being between 100 and 170 grms; even taking the minimum average weight of 60 grms. for 80 to 100 bunches per plant, it may be seen how good the harvest was. In a vineyard planted with *Madone* 8 years old, mounted on wire, and well pruned (well pruned, disbudded at the beginning), the harvest could be estimated at over 20 lbs. per plant.

Wine made from *Madone* contains 10° of alcohol, whereas that made from Aramon grown in the same soil contains 5 or 6°. It has a fine, strong colour, of a better red than that of most wines made from hybrids, which usually have a violet shade.

The growing of *Madone* is greatly extending in France on account of its qualities — great fertility, considerable and regular annual yield, resistance so far at least, to all cryptogamic diseases without any copper or sulphur treatment.

According to M. ANGLES' investigations on the affinity of *Madone* for stock, this plant has decided preferences. Apart from its perfect affinity for *Riparia* and *Rupestris*, it may be grafted with varying proportions of success on all the others. The following stock are given in order of the strength and yield obtained with them in 1917: — *Riparia* and *Rupestris* 101-14 perfect knitting; the former gives finer fruit with larger seed; the stock 216-3 is as good for *Madone* as *Riparia*; 41-B and 93-5 are equal, but come a good deal after the first three; 222-21 also seems satisfactory; 1616 A follows, without great strength; *Solonis-Riparia* 1616, 261-49 and 161-49 do not appear to be satisfactory subjects.

72 - **The Cultivation of Grapes for Export in the District of Almería, Spain.** — HARO, SALVADOR, in *Información agrícola*, Year VII, No. 157, pp. 330-333. Madrid, October 1st, 1917.

For a great number of years vines ("parras", "parrales") bearing grapes for export ("uva de embarque") have formed the chief agricultural wealth of the Almería district (Andalousia). In this town and in the

(1) [illegible], No. 6[illegible].

neighbouring villages, the houses are often covered with vines which reac up to the roof; the grapes are not picked till Easter, when a large quantit is eaten. This gave rise to the idea of exporting these grapes which kee so easily. They were originally exported in esparto baskets, for which later, were substituted barrels containing cork shavings.

Cultivation was greatly reduced by the appearance of phylloxera, bu spread again with plantations of vines grafted on to Riparia, Rupestris Berlandieri, or on hybrids of Berlandieri with the local varieties white Barc and Castiza.

There are white and black Almería grapes; they all have large round o oval seed, according to the variety. The white grapes are most widel grown because they have a more pleasant flavour, but, since they have thinner skin, they are less exported than the black grapes, which are earlie

The cultivation of these grapes, which increases every year, is carrie out as follows: about 400 to 600 vines are planted on one acre at equ distances, in squares. The vine is allowed to grow, cutting all the shoot which appear, till it reaches a height of from about 8 to 10 feet. At th height above the soil, is then built a trellis of wire, crossed so as to for squares about 20 inches wide, the ends being strongly fastened to pos driven into the ground near the vine. When the plant begins to grow all th young shoots are fixed on to the metal trellis by tying them with string un the desired shape is attained, when it is no longer necessary to tie ther The shoots which grow above the trellis are cut. Besides pruning, which carried out with great care, the ground is shallow cultivated three times, th last time being preceded by the spreading of manure. Various manures are used; the most common is composed of 132 lbs. superphosphate (18-20%), 22 lbs. ammonium sulphate; 44 lbs. sodium nitrate; 22 lbs. iron sulphat About 528 to 616 lbs. of this mixture are broadcast per acre. The manu is dug in in February. If it does not rain a few days after, a first irrigati is given; there are two other irrigations during the course of the year.

When the first leaves began to open treatment with sulphur and B deaux mixture is begun; at least three treatments with each mixture given in the year. Up to the harvest, which usually begins at the end July, the soil is hoed and its surface broken.

As soon as the grapes become juicy thinning of the leaves ("despampa nado") is begun. This operation, carried out by women, consists of cutting away the leaves round the clusters, so that the sun may penetrate and hasten ripening. During this operation, besides the damaged leaves, the spoilt grapes are also removed, the plant is then washed with water (by means of a spray) to remove the dust and help leaf transpiration. These two opera tions, especially the first, are continued daily till the harvest. The har vest and packing into barrels is carried out almost exclusively by women and children. The bunches of grapes are cut with scissors, care being taken not to damage them. They are then placed in vats, capable of holding from 60 to 80 lbs., which are not entirely filled and which are transported to another place, where a larger staff sorts them for the first time; they are then resorted with greater care. The packing of the barrels wit

ernate layers of grapes and corkshavings, so that the shavings come at h end of the barrel, is done by women ; the barrels are closed by men. Each barrel contains about 55 lbs. of grapes. The average harvest is ¼ million barrels. The price is dependent on the British market, which the largest buyer. Glasgow is one of the chief importing ports.

The cost of packing is estimated at 5*d*. a barrel, plus the cost of the rel and the wages of the packers: 1*s*. 3*d*. to 1*s*. 8*d*. a day. Each women required to fill 100 barrels a day.

Dalias grapes are most favoured and fetch from 5*s*. to 6*s*. a barrel more n those from other places. This is due to more careful cultivation.

3 - **Reforestation on the National Forests of the United States** (1). — TILLOTSON, C. R. (Forest Examiner), in *United States Department of Agriculture, Bulletin* No. 478, Contribution from the Forest Service, *Professional Paper*, pp. 63, fig. 5 + 11 plates. Washington, May 2, 1917.

The Bulletin analysed is a revised edition of a preceding one (No. 98 W. T. Cox), but it has been brought up to date as regards the results of reforestation work of the Forest Service in the United States and the thods at present employed.

In the United States National Forests there are about 5 000 000 acres be reforested. The greater part of this area consists of land where former sts have been entirely destroyed by recurring fires. The complete restock- of the areas now denuded, or sparsely timbered, will increase the annual od production at least 3 000 000 000 ft. For this reason, reforestation is essential feature of National Forest Administration.

The bulletin analysed contains a description of the methods of collect- and preparing forest seed.

The following data, which are of considerable practical interest, are ob- ined from the various tables given.

	Trees per acre	Seed per acre — lbs	Net cost per pound —
Douglas fir	1	33 00	$ 0.60— 1.50
Western yellow pine (*P. ponderosa* Laws.)	8	30 00	0.41 - 0.67
Lodgepole pine (*P. murrayana* Engelm.)	40	8 00	1.70 - 2.00
White pine (*P. strobus* L.)	7	7 00	2.43 - 2.53
Norway pine (*P. resinosa* Ait.)	8	4 00	2.03 - 3.19
Engelmann Spruce (*Picea engelmanni* Engelm.)	12	12 00	1.06 - 2.41
Sugar pine (*Pinus lambertiana* Dougl.)	8	80 60	0.50 - 0.85

Of a total area of 124 732 acres covered up to June 30, 1915, 84 320 res were seeded directly and 40 412 acres were planted.

The writer describes the methods of sowing and planting adopted, gives figures, the rules to be observed, and the relative cost per tree, region d method.

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(1) See F. November, 1917, No. 1030.

1174 – **Forest Products of Canada.** — I. BATES, J. S. (Superintendent of the Forest Pro Laboratories of Canada) and LEE, H. N. (in Charge of Timber Physics), Canadian W for Structural Timbers, in *Department of the Interior, Canada, Forestry Branch*, Bull No. 59, 44 pp. + 3 fig. + 19 plates. Ottawa, 1917. — II. Forest Products of Can 1916, Pulpwood, *Ibid., Bulletin* No. 62[b], 12 pp. + diagrams and maps. Ottawa, 191

The Forest Products Laboratories of Canada, established at Montr by the Department of the Interior, in co-operation with Mc. Gill Universi have undertaken an investigation of the woods of the different spec of trees in Canada.

I. — The first-named publication begins by stating the available a authoritative information regarding the indigenous coniferous woods Canada, and compares them with foreign woods, especially with those i ported from the United States. Some account is also given of Canad forests and timber supply and of the present development of the timber tra in that country. The principal woods are mentioned, particularly t chief structural woods. The latter, named in order of merit and resour are : Douglas fir (*Pseudotsuga mucronata*), western hemlock (*Tsuga hete phylla* Sarg.), eastern hemlock (*Tsuga canadensis* Carr.), western yell pine (*Pinus ponderosa* Laws), western larch (*Larix occidentalis* Nutt.), pine (*Pinus resinosa* Ait), and eastern larch (*Larix americana* Mchx. *Larix laricina*). The Douglas fir supplies more of the timber cut in nada than any other single species ; practically all of it comes from Brit Columbia, where 601 643 000 ft., board measure, were cut in 1914.

The writer also discusses the grading rules and specifications for str tural timber.

II. — The second publication of the Forest Service of the same Depa ment deals with another important branch of the Canadian forest industr the pulp and paper industry. In 1916, 1 764 912 cords of pulp wood we used in Canada, the percent. distribution of which was as follows: for pu made by mechanical process, 46.9 per cent.; by sulphite process, 41.3 p cent.; by soda process 0.4 per cent. As in the past, spruce heads the li of the different kinds of wood used, with 68.2 per cent. of the tot followed by balsam fir with 24.5 per cent., hemlock with 4.7 per cen jackpine with 2.7 per cent. and poplar with 0.3 per cent. The exportati of wood pulp and cellulose reached its maximum in 1916, when it rose 367 840 tons, 59 per cent. being of the former, and 41 per cent. of t latter.

1175 – **Mechanical Properties of Woods Grown in the United States.** — NEWLIN, J (in Charge of Timber Tests) and WILSON, T. R. C. (Engineer in Forest Products), in *States Department of Agriculture, Bulletin* No. 556, *Contribution from the Forest Se Professional Paper*, 47 pp., bibliographical index + III plates. Washington, September 1917.

The increasing scarcity of many species of timber which had becom more or less standard in various wood-using industries, is opening the fie

(1) See *B.* 1911, No. 487. ; *B.* 1912 No. 436 ; *R.* 1916, pp. 1268 and 1273. [*Ed.*]

other species ; hence it is necessary to have definite information and data ich render it possible to compare the properties of a known species th those of any other.

The publication analysed gives practical data that can serve as a ba- for: 1) the comparison of the different species; 2) the selection of species itable for special requirements ; 3) the compilation of reliable figures for es of the resistance of the various woods.

The data are based upon about 130 000 tests (of 126 different woods) ried out by the Forest Products Laboratory, which is maintained by United States Forest Service with the co-operation of the University Wisconsin. It is planned to continue the series of tests until all species wood which are important, or which give promise of becoming so, have en included. The data are given in 2 series of tables, one for green wood d the other for air-dry wood. The scope and method of experiments are t set forth, together with a definition of the terms used.

6 - Yields from the Destructive Distillation of Certain Hard-Woods in the United States. — PALMER, R. C. (Chemist in Forest Products), in *United States Department of Agriculture, Bulletin* No. 508, *Contribution from the Forest Service*, Professional Paper, pp., 2 fig. Washington, 1917.

The results of experiments carried on at the Forests Products Laboratory, maintained at Madison, Wis., by the United States Forest Service, in co-operation with the University of Wisconsin. The object of these investigations was to determine the relative value of the various hardwoods commonly used for destructive distillation (and of the different forms of material such as bodywood, limbs and slabs) in comparison with the standard American species, beech, birch and hard maple. The bulletin analysed gives the yields for: white elm (*Ulmus americana* L.); slippery elm (*Ulmus fulva* Michx) ; silver maple (*Acer saccharinum* L.) ; green ash (*Fraxinus lanceolata* Marsh) ; blue ash (*Fraxinus pensylvanica* var. *lanceolata* Sarg.) ; yellow ash (*Fraxinus quadrangulata* Michx.) ; *Fraxinus velutina* Torr. ; chestnut oak (*Quercus Prinus* L.) ; tanbark oak (*Pasania densiflora* Orst.) ; californian black oak (*Quercus Californica* Coop.) ; Louisiana swamp oak (*Quercus* spp.) ; and *Eucalyptus* spp.

Previously, " red gum ", chestnut, *Micoria* sp., *Quercus alba* L., and *Nyssa sylvatica* Marsh had been tested. Of the above-mentioned trees, *Pasania densiflora* gave the highest yield of 80 per cent. acetate of lime from the heart wood, *Eucalyptus* from the slab-wood and *Quercus Californica* from the branches.

The largest amount of 82 per cent. methyl alcohol was, on the other hand obtained from the heartwood of the ashes, the slabs of eucalytus, and the branches of *Fraxinus pensylvanicum* var. *lanceolata*. The relative yield of these species exceeds that of beech, birch and hard maple, with which they are compared by taking the average of the latter as 100 per cent. It is however, necessary to observe that the laboratory yields of acetate of lime are over 50 per cent. higher than those obtained in standard commercial practice, though the alcohol yields do not differ much from the commercial yields. The slabs sometimes contain more acetate and alcohol than the body

wood ; this is the case with *Quercus Prinus* and Eucalyptus, and is a matt of considerable interest to the saw-mill.

LIVE STOCK AND BREEDING.

1177 – **A Disease of Cattle in the Philippine Islands Similar to *Anaplasma Marginale* Theiler.** – BOYNTON, W. H., in *The Philippine Agricultural Review*, Vol. No. 2, pp. 110-127, bibliography of 7 publications. Manila, 1917.

In 3 native cattle from Batan Island which were taken to the Man Veterinary Research Laboratory in June 1915, there were observed bod in the red blood cells similar to *Anasplasma marginale* as described THEILER and SIEBER. One of the animals, a cow, presented also the sym toms and lesions of Anaplasmosis as described by the above-mention writers. The heart blood of this cow was injected subcutaneously into bull which was supposed to be susceptible to the disease, but without a demonstrable effect, either physically, or by blood examination, upon th animal during a period of 226 days.

These 3 cases are the only ones which have come to the notice of t writer during the past 20 months. This creates a doubt as to whether an plasmosis really exists in the Philippine Islands, or whether these anima suffered from some other ailment which brought about the formation these anaplasma-like bodies in the red blood cells.

On studying the literature dealing with the subject, the writer fou that mention is made of the fact that bodies similar to *Anaplasma* may produced artificially. He therefore concludes that, " from the resu obtained by various investigators, and from the results cited herein, nothi definite can be stated as to whether there is an actual infectious disea caused by a protozoan micro-organism which THEILER classifies as *An plasma* or whether these marginal points are merely secondary effe from various conditions ".

" There is a possibility that there is an infectious disease caused *Anaplasma* and that there are bodies formed in the red blood cells from v rious other conditions which are so similar to *Anaplasma* in appearan and staining reaction, that they cannot be differentiated at the present time

1178 – **The Avenue of Invasion and the Behaviour of the Infection of Contagi Abortion in the Uterus.** – WILLIAMS, W. L., in *Journal of the American Veter Medical Association*, Vol. LII, New Series, Vol. 5, No. 1, pp. 13-48. Ithaca, N October 1917.

A critical review and discussion of the facts noticed in this connecti and of the interpretations and theories to which they have given rise. T conclusions arrived at by the writer are as follows : the original portal entry of the abortion infection into the system requires further stu but for the present, the evidence points to 2 great sources ; 1) the ute uterine infection of the foetus ; 2) the contaminated milk fed to the ne born calf.

Intra-uterine infection of the foetus. — In the aborted foetus, investigators generally insist that the BANG bacillus is to be found primarily in the digestive tube, secondarily in the blood. They are silent regarding the other bacteria more commonly present. Like all chronic conditions, the abortion infection cannot uniformly, nor generally, end in prompt foetal death. The foetus, whether premature, or born at full term, must be largely infected at birth. HAGAN has traced this well, especially with a bacillus of the colon type, which he recognised in the utero-chorionic cavity of the cow, immediately after calving, and in the rumen and rectum of the new-born calf, though it was healthy in appearance. The calf bearing alimentary infection at the time of birth frequently dies in a few hours from acute sepsis, and yet more commonly develops calf scours and arthritis. Later, the survivors suffer from chronic arthritis, pneumonia and chronic scours. The best way to prevent such pre-natal infection is to disinfect the genital tube of the cow prior to breeding. This operation is difficult, but the technic has been greatly improved and if performed skilfully, conscientiously and perseveringly, sterility is checked by this operation, and much disease is repressed. The bull should also undergo preventive disinfection.

Feeding the new-born calf with infected milk. — The largest number of the BANG bacilli occur in the utero-chorionic space of the gravid uterus; at parturition they escape and contaminate the udder. The calf swallows the infection in sucking, or the milker gets it into the milk and feeds it to the calf. SCHROEDER and others have discovered the BANG bacillus in the milk within the udder, but infection from the exterior of the udder is much more frequent and dangerous. The best preventive measure is to disinfect the genital organs of the cow immediately after parturition, in order to free the udder from genital discharges, and restore the genital system of the mother preparatory to the next breeding. It has been found that once the foetus or calf are infected, the infection remains permanent, oscillating greatly in degree. It is especially significant that large groups of heifer calves suffering severely from scours and pneumonia abort very largely in their first pregnancy.

179 ***Paspalum* and "Tembleque" in the Argentine** (1). — GIROLA, C., in *Anales de la Sociedad rural Argentina*, Year LII, Vol. II, No. 6, p. 150. Buenos-Aires, August, 1918.

Messrs. ROSENBUSCH and ZABALA had plants infested by the cryptogam they considered to be the cause of "tembleque" determined at the Biological Laboratory of the Argentine Ministry of Agriculture. Besides *Paspalum notatum* Flugge, these plants included *P. dilatatum* Poir., and perhaps other related species. They were all attacked by *Ustilagopsis digyscens* Speg., which, besides the two above-mentioned species, also attacks *P. pumilum*, *P. quadrifarium*, *P. Larrañagai*, *P. giganteum*, etc.

(1) See *R.*, September, 1917, No. 943; *R.*, October, 1917, No. 1024.

1180 – **The Susceptibility of the Prairie Dog to Rabies.** — WALTERS, GEORGE, in *Journal of the American Veterinary Medical Association*, Vol. 41, New Series, Vol. 4, No. 5, pp. 703-704. Ithaca, N. Y., August, 1917.

In 1900, the Bureau of Animal Industry of the U. S. Department of Agriculture published a very complete account of the losses occasioned by the prairie dog, or prairie marmot (*Cynomys ludovicianus*) to the stock breeders of the Southwestern States (Merriam C. Hart, *Year Book of the United States Department of Agriculture*, Washington, 1901). Numerous other papers referring to this *Sciurida* have since appeared, but none approach the problem from the hygienic standpoint. *C. ludovicianus* is essentially a "social" animal, living in immense colonies ranging from a few acres to thousands of square miles in area, the population averaging from 35 to 64 per acre. Their natural enemies are the coyote (*Canis latrans*), the badger, (*Meles taxus*), the black-footed ferret (*Putorius nigripes*), and a few denizens of the arid regions.

The prevalance of rabies among coyotes has recently been a subject of legislation and Health Department control in the West of the United States. The fact, which is shown by the writer in the article analysed, that *Cynomys ludovicianus* easily contracts rabies, and thus may spread the disease among coyotes, or catch it from them, is one of great practical importance. The vicious temperament of *Cynomys* (an animal which is very difficult to tame) led the writer to suspect that it would be a good subject of experimental rabies. He first inoculated 3 prairie dogs with anti-rabies vaccine and then with rabies virus. In 3 animals there was a positive reaction, and 2 died. The subsequent inoculations from the brain of these animals gave corroborative results.

1181 – **The Chicken Mite (*Dermanyssus gallinae*); Its Life History and Habits.** — WOOD, H. P., in *U. S. Department of Agriculture, Bulletin* No. 553, 14 pp., 2 fig., 1 plate. Washington, August, 1917.

Object of the publication. This is not to give an exhaustive study of the life-history of the chicken-mite (*Dermanyssus gallinae*), but to work out the main points in the life cycle of this pest and to discover principles upon which combative measures may be based (1).

Rearing methods Used in Life-History Experiments. A large earthern jar, in which a small roost was put, was utilised for a breeding cage. The jar was set in a pan of water, in order to prevent the escape of the mites, and a coarse-mesh wire screen was fastened over the top to hold the chicken in the jar. When it was desired to feed the mites, they were either dropped in the bottom of the jar, or else put on the fowl's back. Sheets of paper were placed at the bottom of the jar to collect the manure and some of the mites. Most of the fed mites were found about the roost in cracks prepared for them.

Moulting, mating and egg-laying took place in tubes or small vials. In case individuals were being watched, vials were used, and where many mites were confined, test tubes were used. The vials were plugged with

(1) See *R.* September 1917, No. 830.

sorbent cotton covered with a small piece of black cloth, which latter cilitated the observation of the small white eggs and larvae. In the ngevity experiments, varied conditions were supplied. Some of the mites re kept on moist sand; others in dry tubes, and others were on roosts. e results obtained are summarised by the writer as follows:

Blood is the necessary food of the mite in all stages except the larva, which stage no food is taken. It takes from ½ hour to 1 hour for the mite feed fully and leave the fowl; it then usually crawls off the fowl and ds a convenient crack or crevice in which moulting and mating take ce. Females deposit an average of 4 eggs each at the rate of 4 in 24 hours ter finishing deposition, the females feed again, usually at night, one gorgement nearly always being sufficient for each deposition. When l of blood the female is elliptical in outline, plump and bloodred. males will continue to feed and deposit 8 times at least, and possibly ener. The female must copulate at least once before she will deposit tile eggs, though fertilisation is not necessary before each deposition. e male does not feed directly after moulting as does the female, but stays the cracks, no doubt to fertilise several females. The proportion of males females is about one to two. The eggs hatch in 2 days (August). The vae, which have only 3 pairs of legs, moult without feeding in about day. The first meal is taken as a first-stage nymph. The first-stage mph before feeding is light coloured like the larva, but is much more ive. It becomes engorged with blood once only and is ready to ult. This stage required 1 ½ days. The second-stage nymph before ding is rather greyish and like the preceding stage, is active. After meal of blood and a moult the second-stage nymph becomes adult; viously, it is smaller than the adult, but much like the latter. All stages er feeding are blood-red. It requires 1 ½ days to bring the second-stage mph to the adult. Unfed females are slightly larger than unfed males. tes that do not get a chance to feed may live 4 or 5 months.

2 – **Studies on the Metabolism of Fats in the United States.** — I. LYMAN, J. F., The Utilization of Palmitic Acid, Glyceryl Palmitate, and Ethyl Palmitate by the Dog, in *The Journal of Biological Chemistry*, Vol. XXXII, No. 1, pp. 7-11. Baltimore, October, 1917. — II. LYMAN, J. F., The Effect of Feeding Free Palmitic Acid, Glyceryl Palmitate and Ethyl Palmitate on the Depot Fat in the White Rat. *Ibid.*, pp. 13-16.

Experiments carried out at the Laboratory of Agricultural Chemistry, io State University, Columbus, and at the Sheffield Laboratory of Phy- ogical Chemistry, Yale University, New Haven.

I. — With two dogs the following utilisation values were obtained: l, 96.7 and 96.5 per cent., ethyl palmitate, 58.8, and 50.9 per cent., glyce- palmitate, 94.8 and 95.4, palmitic acid, 82.5 and 81.0. Emulsified esters tty acids are not absorbed as such, but absorption is limited by the t hydrolysis. While the corresponding esters of palmitic and stearic do not differ markedly as to melting points, the ethyl esters of both liquids and the glyceryl esters being solids at body temperature, still re is a wide difference as to digestibility. The melting point of the ester herefore not the only factor, probably not the chief factor, determining

the rate of hydrolysis and absorption. The writer suggests that the natt of the fatty acid radicle of an ester has an effect on digestibility, aside fr its effect on the melting point of the compound. Experiments are in p gress to determine this point.

II. — After feeding free palmitic acid, glyceryl palmitate, or et palmitate to white rats, essentially the same kind of fat is stored in the depots and it consists largely of tripalmitin. Neither free palmitic a nor ethyl palmitate in appreciable amounts is deposited unchanged the fat depots. The fat deposited as a result of feeding the animals a fat-poor diet differs markedly from that laid down when the diets cont palmitic acid or its esters.

1183 - **A Study of Methods of Estimation of Metabolic Nitrogen.** — FORBES, E. B., M GELS, C. E. and MORGAN, L. E. (Ohio Agricultural Experiment Station), in *The Jour of Agricultural Research*, Vol. IX, No. 12, pp. 405-411. Washington, D. C., June 18, 1

The so-called metabolic nitrogen of the fæces is that portion which h an origin other than as an undigested food residue. It consists of residu from the bile and digestive juices, of epithelium and mucus from the gestive tract, and of such products of bacterial activity as have been rived from digested or from digestible nitrogen. In determining the gestibility of protein — a matter of great importance in relation practical animal nutrition — the metabolic fraction of nitrogen of fæces is an important factor.

The plan of this experiment was to feed a basal ration of corn alo to each of five pigs during the first period, and to add to this corn ratio in subsequent periods entirely digestible protein, in form of milk, bl albumen, and commercial dried egg albumen, to be used in compari methods of estimation of metabolic nitrogen; these methods were: 1) th acid-pepsin method; 2) the acid-pepsin and alkaline-pancreatin metho and 3) the alcohol, ether, hot water, and cold lime-water meth (JORDAN).

The results obtained may be summarised as follows:

The apparent digestibility of the protein of corn, based on the tot nitrogen of the fæces is about 75 per cent. On account of the existence in t fæces of nitrogen of metabolic origin the real digestibility must be high The acid-pepsin method makes it appear that the real digestibility of t protein of corn is about 92 per cent., and the pepsin-pancreatin method als 96 per cent. JORDAN'S method gives appreciably lower figures, averagi 86 per cent.

The acid-pepsin method indicates that 70 per cent. the pepsin-pancrea tin method 84 per cent., and the Jordan method 46 per cent. of the nitro gen of the fæces from corn is of metabolic origin.

All the methods make the nitrogen of blood albumen appear more tha completely digestible, even the apparent digestibility being over 100 p cent.; thus, the feeding of blood albumen with corn seems to increase the gestibility of the corn protein to an extent more than sufficient to offs the incomplete digestibility of the protein of this supplement.

With skim milk the apparent digestibility varies from 95.07 to 104.

per cent., the average being 99.15. The proteins of skim milk are made to appear more nearly completely digestible by the acid pepsin method than by the pepsin-pancreatin method or by the Jordan method.

With egg albumen the results varied considerably, but all were high. It would appear that raw, commercial, dried egg albumen is almost perfectly digested by swine.

Important inaccuracy seems to be inevitable in any determination of digestibility of supplementary foods in the usual way, by difference; and no other method seems more satisfactory.

The digestion coefficients for protein involved in the feeding standards of reference works on animal production assume that the nitrogen of the fæces is entirely an indigestible food residue. The rough measures afforded by the results of this study indicate that, as applying to the digestive capacities of swine, this assumption underestimates the digestibility of protein by about 20 %. In attempting to choose between the methods investigated it seems that the acid-pepsin and the pepsin-pancreatin methods give results which are more nearly true than does Jordan's method, since the latter does not digest the bacteria, which may contain large proportions of the nitrogen of the fæces and which presumably are more largely the product of digestible than of indigestible protein.

There is so far no accurate scientific basis for the determination of the digestibility of protein.

184 – **A Comparative Study of the Feeding of Cattle and Pigs with Regard to Meat-Production.** — GOUIN, A. and ANDOUARD, P., in *La Genie Civil*, Vol. LXXI, No. 10, pp. 137-138. Paris, September 8, 1917.

Studies extending over more than 15 years have shown that, in cattle, for each kilogram (1) gain of live weight, the growth requires 500 grm. of food material per 100 kilos body weight. Thus, while the requirement for growth is only equal to the material incorporated by a 75 kg. calf, it is more than 5 $\frac{1}{2}$ times that amount in a 400-kg. animal.

No matter how quickly growth takes place, the amount required always remains the same.

Much greater than the growth requirement is that of maintenance, which consists in replacing worn-out tissues and maintaining body heat. The writers have found that, for cattle, this requirement is 500 grm. of food material per sq. metre of body surface per animal.* The surface of an animal S as a function of the weight P, determined experimentally by the writers in 1915 on a slaughtered animal, is: $S = 0.67 \times \sqrt[3]{P^2}$.

Recently, the University of Missouri (U. S. A.) has carried out similar researches on a number of animals. The results fully confirm those obtained by the writers:

100 kg.	correspond	to 208 sq. decimeters.	
200 "	"	" 331 "	"
300 "	"	" 433 "	"
400 "	"	" 525 "	"
500 "	"	" 609 "	"

* 1 kilogram = 2.2 lbs.

The surface area increases less quickly than the weight ; the maintenance requirement decreases in proportion as the animals approach full growth.

According to the above remarks on the importance of the maintenance and growth requirements, the gain of 1 kg. per day requires the amount of food material shown in Table I.

TABLE I. — *Amount of food material required to obtain a gain in live-weight of 1 kg per day.*

Live weight	Growth requirements			
	Materials	Work of converting the materials	Daily maintenance	Total
100 kg.	370 grm.	500 grm.	1 370 grm.	2 240 grm.
200	370	1 000	2 060	3 430
300	370	1 500	2 706	4 576
400	370	2 000	3 281	5 651
500	370	2 500	4 306	7 176

In the case of a 100-kg. calf which has gained 400 kg. in 500 days, the animal would have required 1830 kg. of food material, and would have consumed, on a high-scale ration, 2000 kg. of hay containing 45 % of available food material, and 1200 kg. of cake with 78 %, as was found from experiments carried out by the writers for 13 years.

TABLE II. — *Comparison of results obtained by feeding 1 bullock and 3 pigs*

	1 bullock	3 pigs
Cake consumed	1 200 kg.	1 200 kg.
Total growth	400 kg.	330 kg.
Net meat	200 kg.	247.5 kg.
Quality of meat	not ready for slaughtering	very good.
Time required	500 days.	165 days.
Additional foodstuffs . . .	2 000 kg. hay	35 kg. bone meal
Cost of cake	504 fr.	504 fr.
Cost of other foodstuffs . . .	240 fr.	14 fr.
	744 fr.	518 fr.
Cost price of 1 kg. of meat .	3.72 fr.	2.09 fr.
Value of 1 kg. of meat (August 5, 1917).	3.20 fr.	4.40 fr.

Taking hay at 12 fr. (1) per 100 kg. and cake at 42 fr. the breeder would have spent 744 fr. for a gain of 400 kg. that is, 1.8 fr. per kg. of live weight not fattened. On the contrary to the calf, whose daily growth attains its maximum from the day after birth, the young pig produced by a multiparous sow at first grows only slowly. It is only after 2 months from health birth that one can count on a nearly uniform gain of 700 grm. per day, with

(1) 1 *franc* = 0.52 *pence*.

ably early-maturity breeds and abundant feeding. With a high-scale ation, porkers can easily increase from 25 to 135 kilos in from 160 to 165 days, consuming 400 kg. of concentrated foods. The 1200 kg. of these foodstuffs required by a single bullock would suffice for 3 pigs.

If the utilisation of cakes in the shippon and the pig-sty are compared, the differences will be found as shown in Table II. .

Under present conditions, the interest of the breeder coincides with that of the public in giving the preference to pig-breeding. The immediate breeding of large numbers of pigs is the sole method for quickly reducing the shortage of meat.

With 250 porkers, 100 tons of ground-nut and palm-nut cake with 3 tons of bone meal, can be converted, in 6 months, to 20 000 kg. of meat suitably fattened.

1185 - **Horsechestnuts as a Food for Farm Animals** (1). — I. DECHAMBRE, II. VACHER, MARCEL, III. LINDET, IV. TISSERAND, in *Comptes rendus des Séances de l'Académie d'Agriculture de France*, Vol. 3, No. 32, pp. 926-941. Paris, October 24, 1917.

I. — **M. DECHAMBRE**, commissioned by the Academy to prepare a report on the question of the utilisation of the horsechestnut raised by the papers of M. PHILIPPE DE VILMORIN and M. GAIN, has collected information in order to make clear the knowledge we at present possess of the food value of this product and its practical use. In his report to the Academy he first describes previous experiments and their results, then those carried out quite recently under his direction, particularly at the National School of Agriculture of Grignon.

The results of these experiments show that fresh *crushed* horsechestnut may well be fed to sheep in quantities varying between 1 and 2 lbs. per head. *Cooked* by steam or in a boiler, they may, after the water in which they are cooked has been removed, be fed to fattening cattle in quantities up to 6 ½ lbs. per head. They have no effect on the quality of the milk in dairy cows.

In the form of flour, after being ground, and dried so as to get rid of the bitter element, 2 lbs. per head may be given to pigs in their mash. In this form, or after being cooked, they may be fed to poultry, to which they are not suited when raw, even acting as a violent poison to ducks.

II. — **M. MARCEL VACHER** only got pigs to accept horsechestnuts after the nuts had been boiled in an autoclave with potatoes, the proportion of chestnuts not exceeding 10 %.

III. — **M. LINDET** states that horsechestnuts ferment very rapidly giving a large proportion of alcohol : 80 lbs. of chestnuts give 1 gallon of alcohol.

IV. — **M. TISSERAND** points out that at the Rambouillet National sheep-farm horsechestnuts have always been included in the normal ration of the sheep.

1186. - **Chemical Composition and Food Value of the Grass and Hay of *Andropogon rufus* Kunth.** — See No. 1154 of this *Review*.

(1) See *R.*, October, 1917, No. 954.

1187 – The Abderhalden Test for Pregnancy in Animals (1). — ZEIL, C. A., in *Journal of the American Veterinary Medical Association*, Vol. III, New Series, Vol. V, No. 1, pp. 3-47. Ithaca, N. Y., October, 1917.

The ABDERHALDEN test is based on the determination of the presence or absence, in the serum of ferments capable of digesting placental albumins which are believed to be somewhat disharmonious substances present in the blood-stream only during pregnancy. The animal organism permits only material that has been put in harmony with the body, and particularly the plasma, to reach the circulation. The cells of the intestine and liver especially act as important sorters for the whole organism.

If insufficiently transformed substances penetrate into the general circulation, we must expect troubles of all kinds. In such a case, the organism defends itself against injury, and produces certain agents against the disturbing elements, *i. e.*, defensive ferments.

ABDERHALDEN explains the existence of such defensive ferments during pregnancy as follows: the organism of the mother has at its disposal, up to the appearance of pregnancy, a certain amount of cells of a particular kind, which all harmonise with each other in their metabolism. After conception, there appears an entirely new kind of cell which have to perform particular duties. Although the impregnated egg and developing placenta with all its various cells are in harmony with the species, nevertheless the metabolism of all these cells is something new and foreign to the complex of cells composing the organism of the mother. The blood probably receives substances, perhaps also secretions, which are out of harmony with the plasma and remain so, the time being too short for the blood to accustom itself entirely to these new substances. At the expulsion of the placenta, in which process fermentations probably play a preparatory part, the ferments quickly disappear.

These ferments may be demonstrated within about 8 days after impregnation, and they disappear within 14-21 days after expulsion of the placenta. These ferments are strictly specific.

A positive test with placenta fundaments (the tests with other substrata being negative) means the presence of specific ferments for placental albumins, from which we infer that the animal harbours placental elements. It does not necessarily mean pregnancy, however, as the positive reaction may be due to retention of some syncytial cells in the uterus, hydatiform moles and chorioepithelium. Animals suffering from pneumonia and pleurisy with a particularly high leucocytic count, gave a somewhat confusing weakly positive reaction to placental tissue; such animals cannot serve for an ABDERHALDEN test.

After ABDERHALDEN published his first article on the defensive ferments of the animal organism (in 1913), a large number of publications appeared all over the world, some for and some against the test.

The writer carried out his tests with careful attention to the technic which he describes). Of the 497 tests, 260 were experimental. From the results obtained, he draws the following conclusions :

1) See also *B.* 1915, No. 408.

1) The ABDERHALDEN test for pregnancy in animals is very reliable, a scrupulously exact technic is employed.

2) Much care should be taken in preparing the substrates, or fundaents, and in the selection and use of dialysers.

3) The blood which is to be examined must be taken in an absolute ge of hunger, and must be free from haemoglobin and blood corpuscles, d from all contamination.

4) Whenever possible, the animal shoul be examined for the prece or absence of any kind of leucocytosis.

8 - **Heredity, Causes and Importance of White Marks on the Coats of Equine Animals; Research in Italy.** — GUGNONI, CESARE, in *Giornale d'Ippologia*, Year XXX, Nos. 17, 18, 19, 20. Pisa, September, October, November, 1917.

Attention is first drawn to the work of VALVASSORI, PUCCI and TORREGIANI on the white marks on the legs of white and grey horses, and of mules nd that of LANG, ANDERSON, WALTHER and WENTWORTH on the same subct. A study of the results obtained with the Hackney stallion "Polonius," roan chestnut of the Pisa stallion stables, which has a white mark on its de, confirm the supposition that hereditary transmission of the marking ries with its extent. Thus, widely spread marking of the body is domin-nt; that which is limited to a few small marks on the body follows no rule hereditary transmission. This also applies to white marks on the s, stars, etc. in pure breeds of horses.

Marks on the coats of asses. — The experiments of JENKS in Arizona and Texas are first quoted. The case of a Sardinian she-ass resembling an albino s then described. Served by an ordinary ass it had a son which was coloured ll over, as in the case of other mammals (rabbits, rats, guinea pigs); these, contrary to the case of the horse, the factor of complete colouraon, except with rare exceptions, is dominant to its allelomorph, and is pressed by partial albinism. In this case, the character "albinism over he whole body" acted, in relation to complete colouration of the body, in a manner diametrically opposed to the partial albinism of the horse.

Marks on the coats of mules. — After giving the different proportions f marked mules in the various producing countries, the author divides mules having white marks on the legs into two classes:

1) Mules with white marks on their legs, born by marked mares; these re the most common and their marks are very large.

2) Mules with white marks on their legs, descended from asses and orses both of which have permanent white marks; these are more rare and, n most cases, their marks are smaller.

According to the author's observations and data, the mark at the se of the tail should be included among those most likely to be transitted in the cross ass × marked mare. The nerve parts which, in equine as in other animals, have the least tendency to produce pigment re those of the limbs, the centre line of the fore part of the head, the tail and the base of the tail.

The facts observed in connection with the hereditary transmission of hite marks in the cross ass × mare, lead to the supposition that by cross-

ing the horse with other equines, represented by animals influenced eith but slightly or not at all by domestication, there is also less chance of tra mitting this character. However, the results of later experiments m be awaited before it is possible to conclude in favour of the dominance the factor of complete colouration of the coat of undomesticated equi over that of the marking of the trunk of the horse.

After describing the different types of white marks on the coats equines and the manner of their transmission, either by pure-breed or by crossing, the author studies the importance of these characters a the causes determining their apparition. To this effect he considers t action of environment on the production of marked animals and the rel tion between organic resistance and albinism in its varying degrees.

1189 - **Prospects for American Purebreds.** — WENTWORTH, E. N., in *The Field Illustra* Vol. XXVII, No. 3, pp. 182-183 and 212. New York, March, 1917.

The pure bred animals of America, according to the writer's estimat represent only 2.46 % of the American livestock industry, as shown l the following table.

Kind of stock	Total Number in U. S. (Jan. 1, 1916)	Total Number pure breds (Jan. 1, 1916)		% pure breds (Jan. 1, 1916
		Registered	Unregistered	
Horses	21 166 000	171 200	14 340	0.85
Beef cattle	39 453 000	812 000	243 600	2.70
Dairy cattle . . .	21 998 000	567 000	170 000	3.30
Sheep	40 162 000	354 000	141 600	1.07
Swine	68 047 000	1 220 000	1 220 000	3.55
Total . . .	199 826 000	3 124 200	1 789 540	2.46

These pure bred animals constitute the foundation stock. Each ha been improved to perform a certain function better than the average o its species, and its value is measured by the degree to which it can transmi this performance to its offspring. Pure bred males are of two classes those whose function will be to sire only market animals, and those whos function will be to sire more seed stock. As far as numbers are concerne the first class is predominant, although constructive breeding, even th future of breeds themselves, depends on the few reserved for the secon purpose. Approximately 90 to 95 per cent. of males are included in th first class, draft horses alone excepted, while only 5 to 10 per cent. belon to the second. In fact this restriction is so great, that only 3 to 5 per cent of all registered animals living four or five generations ago are enumerate in modern pedigrees. There are therefore two types of livestock me in America : the constructive breeders and the producers. If the pur breds America has today can supply the necessary sires for the productio herds, as well as the necessary seed stock, the demand will be fulfille As a matter of fact, this demand is not supplied at present, witness th

ceptional auction prices of the last few years. Hence a healthy growth the number of pure breds may be expected. Seed stock will still be aded and there will be room for thousands of additional breeders. Pro- ded that the stockman is not a speculator, there is no business in which ure success is more certain ; 2.46 % of pure breds where 5 to 7 % may ecessary is a margin of surety for years to come for all careful and con- rative American breeders.

- The Rehabilitation of the Milking Shorthorn in the United States. — WEIS, P., in *The breeder's Gazette*, Vol. LXXII, No. 12, pp 323-326 Chicago, September 20, 1917.

It is a significant fact that the controversy about the Milking Shorthorn eed ceased almost simultaneously with the beginning of the rise in beef ices. Until two years ago even authorities on the dual-purpose question lieved quite generally that the breed would be confined to the east and rthwest of the United States and to the general farmer. But when the st volume of the Milking Shorthorn Yearbook was compiled by the Ameri- n Shorthorn Breeders' Association two years ago the fact was revealed at the breed was not confined to those parts of the country only but was ginning to make friends everywhere. Today the call for breeding stock almost as strong in the south as in the north.

There is no doubt that if breeders of Milking Shorthorns would have wed the policies of breeders of dairy cattle in advertising their breed he creation of a number of phenomenal milk records, progress would been made more rapidly. That this would have been possible is n by the attainment of a number of high records such as Rose of Glen- s 18 075 pounds of milk in a year, and others, but breeders of the dual ose Shorthorn are laying more stress on the attainment of moderate distance records under ordinary farm conditions rather than on the inment of short-time phenomenal records made under the most favour- conditions.

At the close of 1916 the Record of Merit list for the breed contained the es of 427 animals. Of this number 69 cows have made more than 00 lbs of milk a year, and 278 well over 8000 and under 10 000 lbs. Dur- this year a large number of Shorthorn cows has been put under official and there will be a perceptible increase of animals with authentical k records at the end of 1917.

There were about 200 breeders of milking Shorthorns at the beginning 917 distributed over 33 states, and indications are that the year will close h well above 300 breeders in every State of the Union.

The first public sale of milking Shorthorns was held in America in rch, 1916 ; an average of $ 562 was realized on 54 head. The second e resulted in an average of $ 751. Prevailing prices for dual-purpose orthorns are a fair reflection of the rapidly increasing demand for this nd of stock.

If breeders keep up their efforts toward a still better and more beauti- l animal, their ultimate success in the complete rehabilitation of the breed ll be but a matter of a few years.

1191 – **The 15th. Egg-Laying Test at Hawkesbury Agricultural College, New So Wales, April 1, 1916 — March 31, 1917.** — Ross, G. D. and Hadlington, Ja *Department of Agriculture, New South Wales, Farmers' Bulletin* No. 114, pp. 21. Sy July, 1917.

The 15th egg-laying competition gave better results than all previ ones, both as regards general excellence and the records of groups and in vidual hens. The mortality also was very low ; these facts taken toget are an indisputable evidence of progress in 15 years of continual selecti

As many as 540 fowls took part in the competition; 420 were fi year hens, and 120 second-year hens. Of the former 240 belonged to li breeds, and 180 to heavy breeds. The first-year hens were kept sepa and tested individually, while the second-year birds were still teste groups of 6. The general results were as follows :

Results of 15th Egg-Laying Competition at Hawkesbury Agricultural Coll

First-year Hens		Second-year Hens		
Varieties	Eggs per hen	Varieties	Eggs per Hen in 1915-1916	in 19
Light Breeds:				
210 White Leghorns	219	84 White Leghorns	213.9	1
18 Chinese Langshans	219	—	—	-
6 Sicilian Buttercups	154	—	—	-
6 Black Leghorns	159	—	—	—
Heavy Breeds:				
108 Black Orpingtons	194	30 Black Orpingtons	207.2	162
12 Plymouth Roks	209	—	—	—
36 Rhode Island Reds	179	—	—	—
18 Silver Wyandottes	203	6 Silver Wyandottes	232.8	133
6 Sussex Reds	164	—	—	—

Of the first-year section, the light breeds gave, as an average per h 216 eggs, and the highest total per group (6 White Leghorns) was 1526 e or 254 per bird. Only 2 groups failed to reach the total of 1000 eggs. heavy breeds gave a maximum of 312 eggs per hen, and 1479 eggs per gr or 246 eggs per hen. The number of 312 eggs in one year beat the prev worlds' record obtained at Oregon Agricultural College. The second p belonged to a fowl which laid 308 eggs; many laid nearly 300. One B Orpington laid 2 normal eggs on May 5, 8, 10, and 15, 1916, and als laid 1 normal egg the day before and the day after she laid the 2 eggs. general number of eggs per hen in the light breed and heavy breed sect is 205.8 per fowl ; this beat the record previously obtained at Hawkes in 1910, which was 184 eggs per fowl as a general average of all the competing. These remarkable results are due in part to the great taken of the hens, but also largely to the fact that the birds were of

elected breeds. The food given consisted of the following rations given *d libitum* :

Morning mash: 22 oz of common salt dissolved in the water with which the mash was ired; 60 lbs. pollard; 20 lbs. bran; 12 lbs. lucerne dust; 8 lbs. meat or blood meal.
Evening ration of grain: $^2/_3$ wheat; $^1/_3$ crushed maize.

The average cost of feeding the 540 hens for one year was 6*s.* 7*d.*; he difference between the price at which the eggs were sold and the feed-ng-cost was 14*s.* 11*d.* per hen.

192 - **Brazilian Ducks: "pato do matto" (*Sarcidiornis carunculata*) and "pato bravo" (*Cairina moschata*)** (1). — *Chacaras e Quintaes*, Year VIII, Vol. XVI, No. 2, pp. 105-107 + 1 coloured plate. São Paulo, August, 1917.

Sarcidiornis carunculata, called in Brazil "pato do matto" or "pato e crista", and in the Amazon district, "pato de Cayenna" and "pato stelhano", is common in the coastal region of Brazil and the Amazon istrict. Its flesh is very tender, but it is not adapted to domestic earing. It is shot during the period when it moults its wing feathers, s then it cannot fly very high.

Cairina moschata, which, according to the Author, is derived from the receding species, is called in Brazil "pato" or "pato bravo" (wild duck), r "pato domestico" (domestic duck), according to whether it is wild or omesticated. It is the muscovy, or musk-duck (in French "canard muet" i Italian "anatra moscata"), and is found throughout Brazil. When ild, its plumage is green-black with metallic reflections, and the breast nd abdomen are white. As the birds grow old, the white colour spreads more nd more, and sometimes covers the whole plumage. This duck is easily ed and does not require particular attention; all that is necessary is that he young be protected from damp at the time of the heavy rains. *Cairinia oschata* grows more rapidly even than rabbits; at 3 months some will ive 6 $^1/_2$ lbs. of very delicate meat. On account of their slight flavour of usk the eggs are chiefly used in pastry-making, for which they are in reat demand.

The cross between the "pato" and "marreco", called in northern razil "patury" or "paturola", produces an excellent tender and tasty esh. Its breeding for this purpose is recommended.

193 - **The Advantages of Full Sheets and Bottom Starters in Sections.** — GREINER, C. C., in *American Bee Journal*, Vol. LVII, No. 4, p. 120, 4 figs. Hamilton, April, 1917.

In order to obtain regular combs bottom starters are advocated. When tarting only from the top the frames are incompletely fitted and the bees

(1) *Sarcidiornis carunculata*, of Brazil, Paraguay and the north of the Argentine, and *airina moschata* are found from Mexico to the Argentine and belong to the family of *natidæ*, sub-family *Plectropterinæ*. The first of these birds perches on trees and nests in he hollows of trunks; it lays a dozen white-shelled eggs, and sometimes more. The second often bred in the waters of parks and gardens. — Cf. *The Cambridge Natural History*, ol. IX, Birds, p. 134. London, Macmillan and Co., 1909. (*Ed.*)

finish them much as in the old hives. On the other hand, when bottom starters are used, the lower part of the comb fills the whole width of the frame, thus increasing the honey production. Starting from the bottom does not exclude starting from the top. It was seen that bees build up the comb from both ends at the same time, and join the two parts when they meet.

1194 – **The "Black Worm" Silkworm of Cambodge.** — GACHON, in the *Bulletin Economique de l'Indochine*, Year 20, New Series, No. 125, pp. 301-302. Hanoi-Haïphong, July-August, 1917.

In the course of a journey through Cambodge in June 1916, the Author (Inspector of the agricultural and commercial Services of Indochina) noticed in silkworm rearings, in certain villages, larvae of a dark, bottlegreen colour among the common larvae with yellow cocoons of the polyvoltine Indochinese race.

The larvae, known locally as "black worms" are, according to the natives, more vigorous than those of the ordinary race and are also more resistant to the great heat and to the humidity of the monsoon season. Their cocoons are very similar to these of ordinary larvae, but the writer thinks they are of finer and less satiny staple.

The rearing of these "black larvae" is confined almost exclusively to certain districts.

Some dozens of cocoons were brought to Tonkin, many hatching out on board ship while sailing from Saïgon to Haïphong. There seemed to be no sensible difference between the male and female moths of this and the ordinary Indochinese race.

The larvae obtained from eggs laid by these moths were reared in the experimental nursery at Kiên-an. The first rearings took place in August and gave good results, as did the second, carried out in September. The larvae resisted the high temperatures and the storms of the months of August and September very well, showing no traces of the diseases ever becoming more common in summer rearings ("flacherie", "grasserie", etc.).

The moths resulting from the second rearing were crossed in October with moths of the Tonkin breed, negative results being obtained; the progeny was always clearly separable into half "black larvae" and half native larvae. Further attempts in November and December gave no better results.

The pure race of "black larvae" suffered greatly from cold in January although reared in a heated nursery; they remained weakly, and produced small, poor cocoons.

In February and March all the "black larvae" died. It should be remarked, however, that these winter rearings were carried out by natives alone, with no guidance or supervision of an European expert.

The writer thinks that the experiments should be repeated, on account of the unfavourable conditions of 1916.

If it is found that the "black larvae" from Cambodge behave better than the native ones during the hot and stormy season from June to Sep

mber, it would be worth while breeding them at Tonkin. The eggs uld be preserved in cold-storage during the winter and spring, or else aring might be continued in special heated nurseries, or again, a cer- in number of eggs of this variety might be brought from Cambodge out the end of May.

95 - **The Use of Viper's Grass in Feeding the Mulberry Silkworm.** -- LAMBERT, F., in *Annales de l'Ecole Nationale d'Agriculture de Montpellier*, New Series, Vol. XV, Pt. I-II-III, pp. 12-19. Montpellier, July, 1915 to January, 1917.

This paper passes in rapid review many experiments in the feeding *Bombyx mori* with various leaves (including those of the mulberry). ey were carried out in different countries from 1826 onwards, and 'er particularly to viper's grass (*Scorzonera hispanica*); salsify (*Tragopogon porrifolius*); colt's foot (*Tussilago Farfarfa*); dandelion (*Taraxum Dens leonis*); silkworm thorn (*Cudrania triloba*) (these last experiments have been continued uninterruptedly for 10 years by the author, rector of the Montpellier Sericulture Station); etc.

The author draws the following conclusions:

When viper's grass leaves are fed to mulberry silkworms, they first all absolutely refuse them; later, forced by hunger, they taste and eat m. Usually these larvae die before spinning their silk. It is only ely that a few cocoons are obtained, and that, from these cocoons, ne moths which lay eggs.

The larvae from the eggs laid by these survivors will accept viper's ss more readily than their parents, and the larvae of the following neration will accept it yet more readily.

From generation to generation an increasing number of larvae spin ir cocoons, and it would thus seem possible, after a certain number generations, to obtain a breed of silkworms which will adapt itself fairly ll to viper's grass leaves. In a similar way, at Montpellier, the author ccessfully accustomed larvae of a French breed to eat the leaves of *drania triloba*, used since time immemorial by Se-tchouen breeders to d their larvae from the first stages onwards. After 10 consecutive ars of experiments, larvae thus fed gave cocoons weighing, on an average, 24 grm., whereas the average weight of the cocoons of mulberry-fed vae is 2 grms. Nevertheless, *Cudrania* resembles mulberry much more sely than viper's grass. The cocoons obtained with this latter plant uld, therefore, apparently be at least equally unsatisfactory.

These results show the possibility of the transmission and increase, heredity, of the capacity of the silkworm to live on a food foreign to customary food, the mulberry. These facts, interesting from a theoretical point of view, might perhaps be applied practically in countries ere the climatic conditions are not adapted to the cultivation of the lberry for the production of cocoons, but appear completely void of hnical interest in those where the mulberry grows well, and can bear, ithout much damage, repeated defoliation.

The mulberry, an essential foodstuff of the silkworm, is as superior all other respects to the various plants which have been tested as a

substitute for the feeding of *Bombyx mori* (Osage orange, paper mulberr *Cudrania*, viper's grass, etc.) as *Bombyx mori* is to the wild silkworm of the oak, ailanthus, plum, etc. in the production of silk.

1196 - **French Eggs and the Cultivation of Silkworms in Persia.** — SECRETAIN, C., *Annales de l'Ecole Nationale d'Agriculture de Montpellier*, Vol. XV, Pt. I, II, III, pp. 4o. Montpellier, July, 1915 to January, 1917.

The author studies the following questions with reference to Persi Importance of the trade in eggs in that country ; the importation of Fren eggs ; method of selling the eggs in Persia ; conditions under which Fren eggs do well in Persia ; the climate of the Ghilan ; choice of breed ; choic of eggs ; the packing of the eggs, the forwarding of the eggs ; sale of th eggs. He comes to the following conclusions : To capture the Persian eg market it is necessary : 1) to act without delay ; 2) to supply a strong bree well suited to the climate ; 3) to procure good eggs ; 4) to form a gener export Syndicate ; 5) to choose good representatives.

1197 - **The Selection of Cocoons in Silkworm Rearing.** — See No. 1210 of th *Review*.

1198 - **The Work of the Madras Government Fishery Department in British Ind During the Year 1915-1916.** — *Bulletin of the Imperial Institute*, Vol. XII, No. pp. 113-114. London, January to March, 1917.

For many years, the Madras Government Fishery Department has be successfully engaged in developing the sardine-oil and guano industr Experiments with this object in view were carried out as far back as 1911-19 at the Cannamore Experimental Station, and since that date at the Tan Experimental Station. While in 1909, there was only one private facto of fish guano and oil, there were 50 in 1911-1912, and 250 in 1915-191 The method of preparation in the small factories was extremely simpl The sardines are boiled in open caldrons of a capacity of about 500-7 kg. The resulting mass is placed in sacks of coco-fibre and pressed in t dinary screw-presses. The guano cakes are broken up and spread in t sun to dry. The oil thus obtained is crude brown oil ; it can be refined separating out the clear oil by means of brown, soft, stearine. Ma samples of these products have been examined at the Imperial Ins tute (London). Tables I and II reproduce some of the analytic data.

TABLE I. — *Composition of Sardine Oil from the Presidency of Madras.*

	Brown oil with stearine	Brown oil without stearine
Specific weight at $\frac{100° C}{15.5° C}$	0.881	0.879
Acid Index	12.1	11.8
Saponification Index (approximate)	200.2	200.0
Iodine Index	155.2%	154.1%

TABLE II — *Composition of 3 Samples of Fish Guano from the Madras Presidency.*

	I	II	III
Percentage Composition of guano:			
Moisture	7.86 %	8.82 %	8.68 %
Crude protein	49.22	53.05	56.40
Actual protein	43.75	45.41	49.06
Other nitrogenous matter	5.47	8.24	7.34
Fatty matter	6.69	5.38	8.52
Other organic substances	7.37	4.73	5.01
Ash	28.86	27.42	21.39
Composition of Ash:			
Calcium (Ca O)	33.10 %	42.32 %	41.12 %
Potassium (K_2O)	0.85	2.17	2.19
Phosphoric acid (P_2O_5)	29.52	35.32	35.56
Composition of ash calculated as guano:			
Calcium	9.6 %	11.6 %	9.0 %
Nitrogen	7.8	8.6	9.0
Phosphoric acid	8.5	9.7	7.6

This sardine oil can be used for the same purposes as other fish oils; the marine is also used in tanning and soap manufacture. Guano is a good fertiliser, it is less rich in protein than the fish meals sold in Europe as concentrated foods, which have a protein percentage of from 50 to 70, but it contains an average quantity of phosphoric acid and fatty matter, and thus can well be used for making fish meal for stock feeding, provided the fish used in its preparation is fresh, and the guano carefully made.

The Tanur experimental station is also engaged in curing fish. In 1915-1916, experiments were made in pickling mackerel (*Scomber scombrus*) with salt and with vinegar and spices.

At the Beypore cannery an experiment was made in storing fish in tins by means of solar heat. The tins were placed in a stout teak box, blacked inside, with a close-fitting double-glass top, the whole being insulated by being placed in a case with double walls. A midday temperature of 240°-275° F. (115-135° C.) was readily attained by using the direct rays of the sun, and by means of a single mirror, a temperature of 290° F. (135.6° C.) was reached. The storing of the tins in this apparatus is stated to have been excellent.

The work of the piscicultural expert was devoted entirely to: — breeding fresh-water fish, both indigenous and exotic; stocking tanks; the introduction of fish for the destruction of mosquito larvae; the inspection of various rivers.

The marine Biologist is concerned with the: exploitation of the g vernment monopolies of the pearl and chank fisheries; commercial impro ment of marine industries; economic improvement of the fishing po lation; educational work; investigation of the life-histories of food fis and their enemies, and related subjects.

Considerable progress has been reported in the Chank-fishing (*Tu nella pyrum*) industry. These shells are largely used for making bang in Madras; the usual method of cutting by hand is laborious and cost but, as the result of enquiries at the Imperial Institute, it was found tha type of machine-saw used for cutting *Trochas* shells was quite suitable cutting *Turbinella pyrum*.

An important feature of the work of the Department is an exp mental soap works, which is under the control of a trained chemist. addition to ordinary and toilet soaps, fish-oil and fish-oil-rosin soaps h been made for use as insecticides. The latter have been favourably ported on by the Government Entomologist, and are in considerable mand. In 1916-1917 the work of the Laboratory will be extended to clude: glycerin recovery; the possible utilisation of some of the les known oils and fats, and indigenous perfumes and colouring matters.

1199 – **A New Disease of the Sprat (*Clupea Spratta*) Due to a Parasitic Cop (*Lernœenicus sardinae*).** = BAUDOUIN, M., in *Comptes Rendus des Séa de l'Académie des Sciences*, Vol. 165., No 13, pp. 410-411. Paris, September 24, 191

It has been known since the publication of Mr. L. JOUBIN'S M moires (*Comptes Rendus de l'Académie des Sciences*. Vol. 127, p. 842 an p. 1177, November 19 and December 31, 1888), that *Lernœenicus sardina* the Copepod parasite of the sardine, can, by attaching itself to th sides of this fish, produce the formation of sub-cutaneous or intramu cular abscesses which may attain a large size.

Hitherto, no one had yet recorded that this parasite, if it attache itself (*by way of exception*) to a sprat, could give rise to a pathological man festation which the writer compares to gangrene. The writer, howeve has recently observed such a case in two fish of this species which we caught off the Vendée coast during the winter 1916-1917.

Bacteriology alone will be able to reveal the cause of these singul lesions, that is to say, the organism conveyed to the sprat by the par site itself.

1200 – **The Possibility of Breeding the Walrus (*Trichechus latirostris*) for Me Production in the United States.** — *The Journal of Heredity*, Vol. VIII, No. 8, pp. 3 345, fig. 5. Washington, 1917.

Dr. ALEXANDER GRAHAM BELL made the suggestion (quoted in th article analysed), that it would be a good plan to tame and breed th "Florida manatee" (*Trichechus latirostris*) (1) as a meat-producing anima

(1) Two other species "of manatee" are known in addition to the one found in Flori *Trichechus inunguis*, living on the Atlantic coast from Mexico to 20° south latitude, and *Senegalensis* which inhabits the African shores and the Indian Ocean. These three varie

The walrus has many useful qualities; it is easily tamed; eats food which has hitherto not been utilised; does not occupy land suitable for cultivation; its meat is excellent, its skin very hard, it supplies a fatty substance, while its bones can be used as a substitute for ivory. When killed, its meat yield is very high: 85 per cent.

The natural food of the "manatee" is "manatee grass" (*Cymodocea manatorum*), an aquatic plant growing in enormous quantities in the rivers of Florida. The stalks of this plant are sometimes 4 ft. long; it rests during the winter and grows with such luxuriance in summer, that a man with strong rakes can fill a boat with it in 1 or 2 hours. Dr. Carl L. Alsberg, of the Federal Bureau of Chemistry, analysed the plant and obtained the following results:

Composition of Cymodocea manatorum.

Water	8.7 %
Ash	12.9
Ether extract	2.1
Protein	16.6
Cellulose	19.6
Nitrogen-free extract	40.0
Ferric oxide	2.46

It is probable that *Cymodocea manatorum* would be easily cultivated in the low, warm waters of the rivers, lakes, and marshes of the southern States of the Union; these waters are at present unproductive.

A law has been passed in Florida for the protection of *Trichechus latirostris*. Amongst other provisions, it inflicts a fine of 500 dollars upon any person who shall hunt these animals, which are still very numerous and easily captured alive, as they are quite harmless.

T. latirostri is monogamous in its natural state; when bred, however, one male can successively serve several females; the latter produce 1 or 2 young at a birth.

1201 – **Skunk Breeding** (1) **in the United States.** — *The Journal of Heredity*, Vol. VIII, No. 10, pp. 452-454. 1 fig. Washington, October, 1917.

The skunk has hitherto been regarded as a noxious pest, a destroyer of birds and their eggs and as the agent of frequent depredations on the hen-

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are so much alike, that it is difficult to fix the limits of their respective habitats. The only other *Sirenida* besides the walrus is the dugong, or Halicore. The *Dugon dugon* is found in Africa, the Red Sea, Ceylon, India, and the Malay Archipelago. *D. Australis* inhabits the coasts of Australia. The *Dugong* is a more distinctly marine animal than *Trichechus*.

(1) The skunk belongs to the genus *Mephitis* which includes several species ranging from N. to Central America. The fur of the skunk is black and white; another form belongs to the genus *Conepatus*; this includes the most southern species. This genus extends to South America, where the animals are very numerous in certain regions (HARMER, S. F. and SHIPLEY, A. E., The Cambridge Natural History, Vol. X, p. 430, London 1909). On Rearing Animals for Fur in N. America, see also: *B.* 1911, No. 2854 — *B.* 1911, No. 51 — *R.* 1916, No. 94. (*Ed.*)

roost. Now, however, it is being recognised as one of man's valuable allies, not only because it destroys many animals which are injurious to agriculture, but also on account of its increasing value as a fur-producer. More than a dozen of the States have already passed laws protecting the skunk, and probably their example will be followed by other States. Already more than 500 persons are engaged in various parts of the United States in breeding skunks, either selling the skins to furriers or disposing of the live animals to others who wish to start fur farms, which are very remunerative.

Skunks are commercially divided into 2 general classes; the spotted and the striped. The first is small and its skin is not so highly prized. When this pelt is put on the market, it is generally called "civet "(1). The second type of skunk produces a pure black pelt (which is the most valuable) or else skins ranging through the intermediate graduations to pure white. Ordinary raw skins are worth from $3 to $6 apiece.

Mr. DETLEFSEN, of the Department of Genetics, University of Illinois, has found a number of mutations which are valuable for their types of fur and he is breeding these and making a study of colour inheritance in the skunk. Some breeders state that they have already been able, by several generations of careful selection, to procure pure black animals which appear to breed true to type.

The principal objection to skunk fur is its strong small which it is often practically impossible to remove, although gasoline is of value as a deodorant, while chloride of lime works very effectually. The scent is ejected by the animal from two oval sacs situated just below the tail. Most skunk breeders remove these scent glands when the animal is quite young by means of a simple operation. One breeder, however, declares that when skunks are reared in captivity and treated with kindness, they no longer throw their scent and therefore any operation is unnecessary. Skunks are easily tamed. The females breed once a year, generally in the early spring. They have 6 to 12 young in a litter. The animal is adult at 6 months old.

FARM ENGINEERING.

1202 - **Electric Ploughing.** — DELAMARRE, A., in *Revue Générale de l'Electricité*, Vol. I, No. 18, pp. 691-700, figs. 14. Paris, May 5, 1917.

Of late years great progress has been made in the use of tractors for cultivation, a statement which does not apply equally well to the use of electricity. The writer considers previous efforts in this direction, with the methods used to resolve the problem of electric ploughing. In discussing the power required for traction, the writer shows that 60 H. P. should be available for hauling. In practice the motors for electric windlasses vary

(1) This name properly belongs to some African *Viverridae*. (*Viverra civetta*) and to the Asiatic forms *V. indica* and *V. gracilis* or "Lisang". Cf. BREHM, *Merveilles de la nature, Les Mammifères*, Vol. I, pp. 548-556. Paris, Baillière (*Ed.*)

om 90 or 100 H.P. With a 60 H.P. windlass 8.64 acres can be ploughed
o 12 hours, while with a 90 to 100 H. P. windlass as much as 12 or 15
cres may be ploughed. But there is a limit to the use of more powerful
indlasses on account of the weight, and efforts should be directed towards
sing material as light as possible.

Tractors and windlasses represent the two systems employed for haul-
ing ploughs. Tractors and motorploughs seem, generally speaking, to be
more suitable for breaking up stubble, ordinary ploughing (6 to 7 ins.), har-
rowing, etc., rather than for deep ploughing, for which windlasses are
usually preferred.

As an electric tractor should be mentioned, if only as a record, the ZIMMERMAN system, from Halle-sur-Saale (Germany).

The balance plough received current from a strongly insulated cable supported at distances of about 130 feet apart. Its distinctive feature was that it hauled itself along a chain fixed at each end of the field. At each headland, after tipping the plough, the current was reversed by means of a commutator, thus changing the direction of the plough. The chain, weighing about 500 to 600 grammes per metre, was moored at each end by a light anchor weighing only 77 to 88 lbs. and which could easily be moved by one man with a lever. The coefficient of utilisation of the plough was over 50 % and only required some 15 to 20 H. P.; its price, including 1½ feet of towing-chain, 2 anchors, 6 waggons, and 1950 feet of electric cable, varied from £360 to £600 according to the power, while the FOWLER steam-capstan cost from 5 to 10 times as much. The cost of deep ploughing 5½ ins. deep, with the kilowatt-hour costing 1.8 *d.*, was 8*s.* per acre. It was introduced into France by M. MAGNIN DE CHARMES with several improvements concerning the method of supplying the current. In spite of its good qualities the ZIMMERMAN plough was not successful. The writer thinks that the idea, however, is worth taking up again.

Electric capstans have been brought to a high state of development by various firms, such as: ECKERT; SIEMENS; A. E. G. (Germany); SOCIÉTÉ ELECTROTECHNIQUE of Turin; GARELLI (Italy); FILLET; SOCIÉTÉ DE CONSTRUCTIONS DU NORD ET DE L'EST at Jeumont, France). If electrical ploughing is not practised more commonly in France, it is due to lack of co-operation between manufacturers and central stations and lack of technical and financial enterprise in agricultural circles. The FILLET and SIEMENS haulages have proved their merits, and now, good results are expected from one made shortly before the war by the SOCIÉTÉ DE CONSTRUCTIONS DU NORD ET DE L'EST.

The SIEMENS gear is chiefly used in Germany and Spain. There are two types, one designed to work alone with an anchor waggon at the other end of the field, and one designed to work in pairs. This capstan consists of a solid metal frame on which is mounted: 1) a 60 to 90 H. P. electric motor; 2) an ordinary capstan whose drum or drums can accomodate 1 200 to 1 500 feet of steel cable and which gives two speeds forward of 13 and 63 inches per second; 3) gearing which can either be coupled up to the windlass or to the rear-wheels, so as to propel the truck and, if necessary, to turn in a very small radius with the plough clear. The tractive effort is 8 800 lbs. The motor is coupled to the windlass by means of a completely enclosed belt which acts as a shock-absorber when the plough fouls large stones, roots, etc.; this device allows the motor to be used for driving threshers, etc. The anchor-waggon used with the double-windlass car, weighs 4 metric tons, and its wheels are fitted with thin discs to increase the hold. The objection to the SIEMENS windlass car is its great weight, 13 tons, which renders transport very difficult.

The 15 H.P. FILLET windlass weighs 8 800 lbs., while the 60-80 H.P. type weighs 13 200 lbs.; its tractive effort of 8 800 lbs is equal to that of the SIEMENS windlass, which weighs 3 times as much. The electric motor is geared up directly to the windlass and also moves

the waggon forward, either by means of a chain drive or by hauling on a cable fixed some 6 feet away. The whole is mounted on a steel frame.

The windlass-car is provided with an anchor-spade consisting of a thick metal plate as lon as the truck, driven in to the ground and permitting of a side pull of 57 200 lbs., *i. e.*, 6 ½ time the weight of the machine itself. Tipping is thus rendered impossible. The JEUMONT wind lass, with an 80 H.P. motor, weighs 13 tons and gives a pull of 8 800 lbs. It may be classe with the SIEMENS type.

The Author favours the light type of machine. Great weight is not required to preven tipping; rational anchoring gives perfectly satisfactory results. It suffices that to resist th pull of the cable the anchorage should have a supporting surface at least equivalent to th sectional area ploughed; the anchorage resistance is equal to that of the plough; the weight the capstan, etc., give additional security. The FILLET anchor-plate offers 1 sq. m. of resi tance surface, *i. e.*, 3 times that of the area of the section. Everything is in favour of the light equipment, which improves considerably the prospects of electric ploughing.

One of the principal reasons why electric ploughing has not been practised more exten ively is the problem of obtaining current supply. A 60- or 80 - H.P. motor can hardly be f economically, even for short distances, at less than 500 to 600 volts; this pressure is quite hi enough for the safety of farm work people, but high-tension distribution is needed from po to part of the farm. The usual arrangement is to run high-tension overhead lines for dist bution purposes and to tap off from them through a portable transformer truck. It is not simple matter to make jockey connections to overhead lines and carry wires thence to the trans former car without risking short-circuits or fatal shocks. A better system is to use an aeria switch so arranged than contact with the line cannot be made or open unless the interrupte is open. This arrangement is more expensive, but the workpeople are safe, at any rate. Th windlass may be 700 to 800 metres from the transformer, so that a smaller number of dis tributing centres is required. The SIEMENS portable transformer is mounted in a double-cradle waggon with two compartments containing respectively the transformer with its cut-outs low-tension fuses, meter, cable drum, etc. Instead of wearing out the cable by trailing i along the ground, it is carried on insulators supported by a rod or on two tubes crossed in X shape.

The cost price per acre (1) is calculated by the writer as follows:

Land can be ploughed 12 ins. deep at the rate of 10 acres a day with a consumption of 32 kw.-hrs. per acre. Three men (one an electrician and a boy can operate a ploughing set, the total wages being calculated a 16*s* a day. The author allows (per acre) 1*s*. 7.2*d*. for labour, 4*s*. 9.6*d*. fo current (at 1.9*d*. per unit, and with an allowance for oil, propelling th windlass, etc.), and 13*s*. 9.12*d* for fixed charges; total = 20*s*. 1.92*d* pe acre. To these working expenses should be added interest on capit and depreciation.

The capital cost of 2 windlasses, plough, 2 km. of cable and the trans former, is about £2000; that of 10 to 15 km. of distributing line up to 600 volts for a 865 acre farm is about £1600; and of the transforme connecting up to the overland transmission system, about £240, makin a total of about £ 4000 (a sum, which, at present prices, should be doubled

Allowing £ 600 for interest, the up keep and depreciation reserve are estimated respectively at 5 % of the capital and there would be a fixed charge per acre of 600 : 865 = about 14*s*.

(1) Only pre-war prices are indicated.

The larger the farm the less would be the cost of electric ploughing; for a 1205-acre farm, it is reduced to 15*s.* 8*d.* Steam ploughing, on the other hand, in the Soissons (France) region, costs about 24*s.* per acre, not including coal and water to be provided by the farmer.

If the windlass is used for harrowing, rolling, etc., the cost decreases to about 12*s.* per acre for a 740-to 865-acre farm, giving a saving of 50 % over the cost of steam ploughing. Tractor ploughing costs 24*s.* per acre at 7 to 8 in. deep, which is equivalent to 30*s.* 5*d* for ploughing 11 in. deep.

1203 - **The Choice of the Type of Agricultural Tractor Suited to French Conditions.** — DE PONCINS, A., in *La Vie Agricole et Rurale*, Year 7, No. 40, pp. 237-244. Paris, October 6, 1917.

According to the writer, a tractor that is well suited to the conditions of French agriculture should satisfy the following essential conditions:

1) Sould be able to work in the heaviest clays, even when wet, slippery, and sticky. The Americans have neglected this question because their soils are usually dry.

2) Should be able to pass again over freshly ploughed land, without causing packing or caking.

3) Should be able to turn in a small radius.

It would be preferable, but not indispensable, that it could either pivot round or set off in the opposite direction without turning round, so as to come back on the same furrow when using a balance or turn-wrest plough.

4) Should be available for carting, either on the road or on any ground for farmyard manure. Tractors with one large driving-wheel are unsuitable for the road and it is their greatest disadvantage against certain important advantages.

5) Should be able to drive the fixed farm-machinery, such as threshers, mills, pumps, etc.

6) The width between the wheels should be sufficiently narrow (50 ins.) to allow it to pass on rural bridges and roads, and so that the ridge can be finished without passing over previous work.

All these conditions are by no means incompatible. The power required depends on the size of the farm, but a certain minimum may be fixed below which mechanical traction loses its advantages (save a few exceptions). This will be seen from the following considerations regarding: 1) the labour; 2) the work; 3) the possibility of finishing the first furrows with the tractor.

LABOUR. — The chief advantage of mechanical traction is economy of labour. Theoretically, only one man is necessary to drive a tractor towing an automatically lifting plough. In practice, two are required, one to drive and one as assistant. A tractor towing a single plough 7 to 8 ins. deep in heavy soil and travelling 3 000 yards per hr. can barely plough 2.5 ha. per day, which is equal to the work of 5 teams of 3 good horses each. With a single-furrow plough there is no saving, but economy commences when 2-furrow ploughs are used. It is only appreciable with 3-furrow ploughs, becoming important with 4 or 5. The writer considers the latter number sufficient, so as to avoid locking up too much capital and using too heavy a weight.

WORK. — Work carried out more quickly in suitable weather. It is indispensable that a tractor should do the greatest possible amount of work in a day; therefore sufficient power should be provided for towing 4 or 5 furrow ploughs at the rate of 5 000 yards per hour.

POSSIBILITY OF FINISHING THE RIDGE WITH THE TRACTOR ITSELF. — To do this the tractor requires sufficient power so as turn over a width of ground equal at least to the distance between the wheels, *i. e.*, of a least 71 inches. Now, a tractor with 2 driving-wheels, towing a furrow plough, is obliged to leave a series of unploughed bands of from 3 ft. 3 in. to 4 ft.

every 130 to 162 yards, which have to be finished by a team. The tractor, therefore, shou be sufficiently powerful so as to tow at least a 4-furrow plough (width of work, 4 feet) or st better a 5-furrow one. Nevertheless this disadvantage is obviated by using ploughs turning t soil alternately to left and right; or at any rate the difficulty would only occur once wh finishing the headland.

After considering the power required for a tractor towing either a 3 4-, or 5-furrow plough in any kind of soil, the author concludes that th 8-16 H. P. tractors are much too feeble and give little advantage over ani mal traction. The 10-20 H.P. type is the minimum, being only suitabl to easily-worked soils. For stiff soils, the 16-32 H. P. type is require allowing for a speed of 2517 yds. per hour; for a speed of 3500 yards p hour, at least the 25-50 H. P. type is required if more than 50 % efficien is to be obtained (windlass or towing).

Considering the methods employed for connecting plough to tracto the writer thinks that the present preference given to tractors indepe dent from the plough will be in future given to tractors carried on 3 or wheels with the plough bodies fixed underneath the motor chassis itself to 2 wheel motors in front combined with the plough in the rear.

Tractors on 3 or 4 wheels and carrying the plough bodies fixed under the chassis, appe to have some theoretical advantages: reduction in length of chassis; easy lifting or engag the shares by using the power of the motor; less labour required of a less tiring nature; econo of metal, giving reduced cost price. Of this type is the motor plough by PAVESI and TOTOTTI of Milan, Italy, as well as the 4 American machines: Lawter One Man Tractor; "Brillio Hackney Auto-plough; Albany-Dover Square Turn. While agreeing that this type is wo the attention of makers, the writer asks whether it would not be better to adopt an in mediate condition by placing the plough not below the chassis but just behind, as in French "Amiot" and the Swedish "Avance" motorploughs.

With the types with front driving-wheels as the Moline (2) and the English "Fowl Plough" and "Crawley-Agrimotor" (3), the advantage lies in utilising the whole lengt of the chassis to grip the soil. This system is suitable for low-powered 2-furrow-machine at the most, a type particularly adapted for vineyards. Martin's Motorplough, another Englis machine, has 4 front driving-wheels, of which two on each side are coupled on the chain-trac system, this giving greater grip and increased power. It only weighs 2 200 lbs and is of 16 H. P This machine has not yet been tested in practice.

The grip on the soil is the greatest difficulty confronting mechanica traction. From this point of view, the windlass and towing tractors seem to solve the problem most satisfactorily. Chaintrack tractors offer a larg surface, so that a heavy weight can pass over soft ground without packin it too much. As yet, sufficient evidence is not available to allow of judg ing the caterpillar tractors from the economic point of view.

Considering tractors from the standpoint of the number of driving wheels, the writer thinks that the tractor with 4 driving-wheels, not yet satisfactorily worked out, would be the best, if it could be realised witho too much complication. The total weight would be distributed over th 4 driving-wheels; the 2 wheels on the right would run in the furrow, the

(1) See *B.*, 1912, No. 550 and *B.*, 1914, No. 557. (2) See *R.*, October 1917, No. 91
(3) See *R.*, October 1917, No. 912.

on the left on the unploughed land ; each one would not be overweighted and furrow-packing would be much diminished. To avoid turning, the machine should be able to reverse its direction and might tow a balance plough or, better still, be fitted with left and right hand bodies that could be raised or lowered alternately. There would be better grip, the power would be used more effectively, and skidding would be decreased.

After calling attention to the disadvantages of solid treads furnished with grips, the writer notes the advantages of the webbed-tread, applied (as far as he is aware) only to an American machine. By webbed-tread the writer refers to a large wheel whose tread is formed by narrow rims joined by cross members. The cross members, being on the level of the lateral rims, travel quite well on the road, the narrow rims acting similarly to carriage wheels. The idea of driving wheels with retractable strakes, as made by some manufacturers, would be satisfatory if their strength was perfectly certain.

Finally, the writer considers the quality of the material and methods of construction requisite for giving lasting qualities to tractors, as well as gear-protection, lubrication, etc., and to avoid repairs and readjustments.

1204 – **Attachment for Adapting a Motorcar to Agricultural Traction** (1). — *Scientific American*, Vol. CXVII, No. 11, pp. 196, 1 fig. New York, September 15, 1917.

This device permits of adapting a motorcar to tractor work with but little trouble, by a special reduction gearing carried independently of the automobile chassis. The device can be attached in 10 minutes and removed in half the time.

The usual road speed of 40 miles an hour is reduced to a farming speed of about 2 miles per hour by the reduction gearing. An engine speed of 1000 revolutions per minute will permit the converted machine to do the work of 3 or 4 horses. The machine is designed on practical mechanical lines, all frame members being of angle steel. The wheels are built up of rolled steel rims and steel spokes and have cleats riveted to the rim to provide a grip.

The wheels turn on large anti-friction bearings. An extra watertank should be provided to prevent the engine from overheating during work.

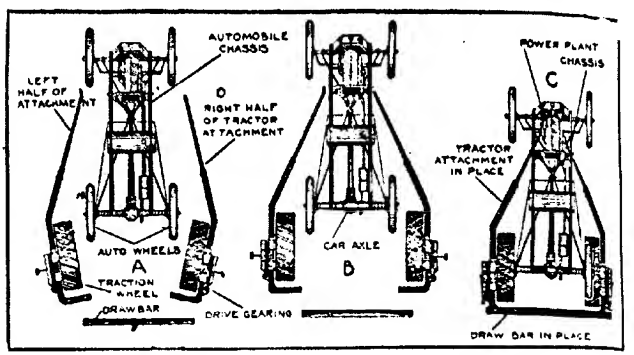
The accompanying figure shows the method of installation. The view at *A* shows the device in such position as to permit backing the car between the 2 sections. At *B* the car is shown in place between the sections and forward members of the attachment, with the latter ready to be pushed under the car. The view at *C* shows the attachment in place.

The construction is such that the wheel hub, provided with special driving lugs, fits into the recess in the hub of the attachment. When in place, the members are firmly secured. The front ends of each section are bolted together and then attached to the front axle by a U bolt fitting. The power from the wheel hubs passes through a train of reduction gears

(1) See also *R.*, June 1917, No. 577. (*Ed.*)

on each section and the traction wheel speed is greatly reduced as compared to the auto wheel speed.

This attachment can be used for a wide range of work now done by horses, such as ploughing, disking, harrowing, seeding, hauling, etc.



Method for adapting a motor-car to tractor work.

1205 – **Rick Drying by Machinery.** — *The Implement and Machinery Review*, Vol. 43 No. 510, p. 608, fig. 1. London, October 1, 1917.

Mr. J. E. NEWMAN uses, on his farm at Pershore, a centrifugal blowing fan for drying his ricks.

The 6-in. centrifugal blowing fan was driven by a 2 h. p. petrol engine and blew air through a wooden pipe made of planks 6 in wide and 16 ft. long, into the centre a the ricks which were built on 8 yd. by 5 yd. staddles. The pipe was built into the rick on the slant, so that the end of the pipe discharged air into the centre. The accompanying figure shows the installation of the device.

Rick drier in position.

Ten ricks were so treated and when threshed the wheat was found to be hard and dry, in better condition than that from ricks erected afterwards in better conditions. Three of the ricks were put up with the clover — which was tall and in bloom when the wheat was cut. — still quite damp.

The ricks did not heat, and when threshed out in the middle of November the corn was dry, and the straw sweet and clean.

One rick was found to be at a temperature of 74°F, and, after half an hour's blowing, the temperature was found to be 56°F, the same as the air temperature.

If the rick to be dried is a large one, it would be possible, by providing a number of outlets to the wooden chute, to deliver the air to different parts of the rick simultaneously, instead of blowing it all to the centre.

306 – **Electricity Applied to the Threshing and Drying of Cereals, in Italy.** — TARCHETTI, A., in *Il Giornale di Risicoltura*, Year 7, No. 18, pp. 229-234. Vercelli, September 30, 1917.

THRESHING. — The wide use of electric threshers shows that the problem has been solved both economically and mechanically.

For threshing carried out in the farm or its immediate neighbourhood, and where a low-tension electric current is available, the steam plant has only to be replaced by the electric motor to obtain secure and regular working with an assured economy of more than 50 % of the previous expenses.

For portable threshers, the electric motor with accessories can be mounted on a waggon, the thresher being driven by means of a belt; or else the motor might be fixed directly on the thresher, being mounted on a bracket which is usually placed in the rear.

With the first system, a better yield is obtained from the belt, but time is lost in placing the waggon in position.

The second system requires protected motors and a very light belt; less space is occupied by the thresher, and the machine is more easily moved.

For ploughing, continuous current motors are preferable, and for threshing three-phase motors of constant speed, which is essential for good screening and winnowing.

The current required for ordinary portable threshers is, on an average, as follows:

for a 24 inch thresher	4 kw
» » 30 »	6 »
» » 36 »	8 »
» » 42 »	10 »
» » 48 »	13 »

ARTIFICIAL DRYING AND HEATING OF THE AIR. — Dryers are now much in use, but they still have certain disadvantages which might be eliminated by using electric heaters placed at various points in the air current. Not only do they provide for a constant temperature, but they allow of increasing or diminishing the heat in the various parts of the drier. With electric heating, the bad smell due to the products of combustion is eliminated. Moreover, it occupies little space, is easily cleaned and requires much less attention than does heating with wood or charcoal (1).

At first sight, comparison between electric and ordinary heating, appears disastrous for the former; theoretically, 1 kg. of coke produces 7000 calories, while 1 kw. barely produces 846.

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(1) Electric heating might well be installed in silkworm nurseries to keep up a constant temperature in the incubation and rearing rooms. (*Author*)

Assuming the ordinary price of coke to be 5 fr. a quintal, the kilowa would have to cost not more than 0.5 centimes to yield, at the same cos the same heating power.

It is, however, different in practice, for more than half of the 7000 the retical calories of the coke is lost by bad furnaces, radiation, etc., whi the heat of the electric heater (which may yield 100 % if it is a good one is completely utilised in the drying room. Nevertheless, even admittin that 1 kg. of coke yields 3000 calories in practice, it would be necessary, order to equalise the cost, to pay a maximum of 1.5 centimes per k.w., whi would not be accepted by any electric-supply company.

Under the present circumstances, the problem shows much mo favourably for electric heating, on account of the high prices of fuels.

This condition may continue for some time after the war, but it evident that the agriculturist cannot afford to pay the present prices f electrical energy for heating the dryer. However, if he could obtain t current required for the farm at contract prices, the electrical heating the dryer (1) would furnish an excellent method for consuming all the c rent provided for in the contract, provided always the current contract for was more than the farm actually required.

1207 – **The "Metrolac" Apparatus for Recording the Amount of Dry Rubber in La tex.** — *The Queensland Agricultural Journal*, Vol. VII, Part. 1. pp. 26-27. Brisbane, 19

For the information of rubber planters, the Rubber Growers' Asso ciation (London) has published an account of an instrument, the "Metr lac", of which the sole manufacturers are MESSRS DRING & FAGE (Londo

The "Metrolac" records the amount of dry rubber in latex, and thi enables a check to be kept on the amount of water added.

The amount of dry rubber in latex to which water has not been adde will vary with methods of tapping, etc., from 3 to 5 lb. per gallon.

This instrument would be particularly useful in controlling latex c lected by the natives, as regards any fraudulent, or excessive, addition water. By means of the "Metrolac", the latex can, after "bulking be watered down to a standard rubber content, so that in sheet-making the sheets are of uniform size and thickness and are generally uniform. Th amount of acid necessary for coagulation can also be determined, for depends upon the quantity of rubber in the latex which is rapidly asc tained by the rise of the "Metrolac". The latter is also of practical app cation when paying coolies by results.

The "Metrolac" is of brass gilt and measures about 10 in. long. is supplied complete with measuring glass (graduated in pounds and ounc per gallon) for testing. When paying the coolies, it is necessary to meas the latex in units smaller than the gallon; the unit suggested is the ha

(1) Considering the amount of heat required for cereals in bulk, in order to evaporate water and to compensate for losses from the dryer, it may be taken that about 6 000 to 11 calories are required, that is, 7 to 12 kw. per quintal of dried material. As thorough dry tequires at least 2 hours, each quintal of cereals placed in the drier requires of from to 6 kilowatts. (*Author*).

t. The calculation is quite simple, for as there are 16 oz. to the pound, 16 half-pints. to the gallon, the instrument will correspond to the ces to the half-pint as well as to pounds to the gallon.

By means of the "Metrolac", a check may be kept on the amount bber obtained and when this tends to fall in trees that are tapped too erely, or are overstrained, the field may, if necessary be, rested.

This instrument can also be used to forecast the daily output of dry ber on an estate.

8 - **The Milking Machine in British India.** — JOHN, H. ST., in *The Journal of Dairying and Dairy Farming in India*, Vol III, Part IV, July, 1916; reproduced in *The Agricultural Journal of India*, Vol. XII, Part. II, pp. 291-295 Calcutta, April, 1917.

Several periodicals of British India have recently considered the possiy of introducing the milking machine into India.

According to English and American reports on trials with the milking chine, it appears that, during the last 2 or 3 years, its construction has n much improved The writer considers the general conditions apperning to its use and thinks that it will sooner or later be introduced India owing to shortage of labour.

Good milkers are every year becoming more difficult to find. The owalla" of former days, milkmen from father to son, are uncommon s. The younger generations seek other occupations in the large towns the Empire, It thus become more and more necessary, in large dairies, train milkers, and it will probably be necessary to replace hand milking machine milking.

To be successful, the milking machine should be introduced gradually, rst only using it for a few cows at a time and only gradually extendits use in measure as it becomes well known. It would be a mistake to oduce it on a large scale now. Trials with the milking machine will, forelong, be carried out in India and a report on the work of the machine ikr on native cows and under actual Indian conditions will be published n.

9 - **Apparatus for Determining the Water Content of Cheese.** — I. TROY, H. C., in *Hard's Dairyman*, Vol. LIV, No. 1, p. 1, fig. 2, Fort Atkinson, Wisconsin, July 27, 1917. — II. *The Journal of Agriculture*, Vol. XXI, No. 3, pp. 11, fig. 2 Quebec, Canada, September 15, 1917.

Laws have recently been enacted limiting the amount of water in ddar cheese. As the ordinary butter moisture test cannot be used for imating the water content of cheese, the writer devised a very simple ing apparatus about 5 years ago, to be used in determining the water ntent of cheese. It consists of a doublewalled copper cup containing lted fat, or oil, between the walls. The temperature of the cup is conlled by inserting a thermometer in the oil and then heating the apparas to the desired point with a small spirit lamp. The outer jacket of the p which holds the oil is 4 ½ inches wide, and the same in height. It s a flat bottom and perpendicular walls. The inner cup must have a t bottom; it is 2 ¾ inches in diameter and 3 ¾ inches deep. A flange its upper rim extends out at right angles to the cup wall and forms a

cover for the space between the walls of the outer jacket and the cup wi in place. The flange is bent down around its outer edge to make it snugly over the upper rim of the outer jacket; it thus holds the inner cup curely in its place, leaving a space for the oil between the walls and bott of the apparatus. A circular opening of about ½ in. in diameter is ma through the flange to permit the insertion of a thermometer. An ordina flat bottom Erlenmeyer flask placed in the oil bath cup may be used to h the cheese during the drying operation, but a long-necked flask is bett A flat metal cover is placed on the cup when making the test, in order keep the body of the flask at a constant temperature. The cover has hole in the centre just large enough to permit of the neck of the flask exten ing up through it. In order to heat it, the apparatus is placed on a trip over a spirit lamp.

The flask should have perpendicular walls and its height should be 4 in. including the neck, which is 1 in. in diameter. The flask must fit w into the cup of the drying apparatus. The copper drying cup can be ma by any tinsmith.

Lard or tallow serves best between the cup walls. Readily inflamm ble oils should be avoided.

Operating the test. — First light the spirit lamp in order to warm the or fat, bath while the test sample is under preparation. A representat sample of the cheese may be secured with a cheese-trier and kept in a gl stoppered sample jar. It is then cut into pieces about the size of wh kernels, and 5 grams of it are accurately weighed into the clean, dry fla When the oil, or fat, has reached the temperature of between 284° to 2 F. (140°-145° C.), as registered by the thermometer, the flask is placed the cup of the oil bath and covered with a flat disc-shaped cover having central aperture through which passes the neck of the flask

The flask is allowed to remain in the bath 50 minutes, the temperatu being maintained between 140° and 145° C. all the time. Then the fla is removed, and allowed to cool. It is subsequently weighed and from t difference in weight is estimated the amount of water removed by dryi

1210 – **Apparatus for Selecting Cocoons in Silkworm Rearing.** — *Le Génie Civil*, LXXI, No. 14, pp. 235-236. Paris, October 6, 1917.

In 1916 the Sericultural Association of Japan opened a competit for the best apparatus for distinguishing male and female cocoons. Of t twenty-seven apparatuses entered, four were awarded prizes, those of Mes AOKI, MATAKEYAMA, OSAWA and TOMITA.

The action of these four apparatuses is based on the fact that the m cocoon is lighter than the female cocoon, but it seems impossible to dist guish with certainty the sex of the chrysalis without opening the coco i. e. by destroying it.

Mr. AOKI's apparatus, which gained the first prize, is exceedingly s ple. It consists of a lever, the two arms of which are in the proportion of 1: At the end of the small arm is a basket into which are placed 15 coc chosen at random, and which, consequently, represent an average we between that of 15 male cocoons and 15 female cocoons. At the end of t

ng arm is a hinged platform, on which are placed successively, one by one, e cocoons tested. The lever is balanced when empty by means of a slid- g weight. According to whether the long arm of the lever falls or rises, e platform sways to the left or to the right, dropping the cocoon into ne of two compartments. If the lever remains equally balanced, i. e., the cocoon is of average weight, and, consequently, undetermined, it is fficient to press a button placed on a support crossed by the long arm of e lever, to make the platform sway forward and drop the cocoon into a mpartment corresponding to a third class.

The other three prize apparatuses are much less simple, but all allow classification satisfying practical requirements.

III - Review of Patents.

Tillage Machines and Implements.

nada 177 722. Stubble burner.
nmark 22 403 — 22 428. Motorploughs.
ited States 1 237 407 — 1 239 090. Wheeled ploughs.
1 237 505 — 1 237 626. Gang-ploughs.
1 237 556. Harrow.
1 237 610. Stubble plough.
1 237 825 — 1 239 281. Ploughs.
1 237 947. Agricultural implement.
1 238 057. Sulky plough.
1 238 252. Disc plough sharpener.
1 238 821 — 1 238 953. Cultivators.
1 238 969. Light tractor gang-plough.
1 238 998. Disc cultivator attachment.
1 239 091. Disc-harrow.

Manure Distributors.

nmark 22 438. Manure distributor.
ited States 1 237 629. Fertilizer dropper.
1 238 170. Fertilizer distributor.

Drills and Seeding Machines.

ited States 1 238 157 — 1 238 158. Clutch mechanism for maize planters.

Various Cultural Operations.

nada 177 412. Plant protector.
ited States 1 237 804. Cotton-chopper.
1 237 854. Cultivator (for maize).

Control of Diseases and Pests of Plants.

ited Kingdom 108 746. Animal traps.

Reapers, Mowers and Harvesting Machines.

nada 177 555. Binder reel.
ly 157 799. Motor mowing machine.
158 295. Universal mower for hay, fodder plants, cereals, etc.
itzerland 76 162. Hand mowing machine.
ited States 1 237 543. Rake and loader.
1 237 661 — 1 237 689 — 1 237 690. Mowing machines.
1 237 695. Grain-binder.

1 237 832 — 1 238 047. Cotton boll harvesters.
1 237 859. Cane harvester.
1 238 402. Maize harvester.
1 239 153. Combined side delivery rake, tedder and swath-turner.
1 239 353. Green maize cutter.

Machines for Lifting Root Crops.

Canada 177 403. Root puller.
177 702. Harvester for roots.
United Kingdom 198 800. Potato-digger.
United States 1 239 337. Beet harvester.
1 239 354. Potato-digger.

Threshing and Winnowing Machines.

Canada 177 410 — 177 615. Threshing machines.
177 583. Vetch separator.
United States 1 237 896. Wind regulator for grain separators.
1 238 970. Automatic shock-threshing machine.

Machines and Implements for the Preparation and Storage of Grain, Fodder, etc.

Switzerland 76 163. Installation for the preparation and storage of maize silage.
United Kingdom 108 557. Elevator for hay loader.
108 774. Baling press.
United States 1 237 305. Hay-loader.
1 237 495. Baling press.
1 237 916. Ensilage packer.
1 237 971. Fruit box press.
1 238 803. Power potato cutter.
1 239 216. Grain drier.

Forestry.

Canada 177 538. Stump puller.

Steering and Traction of Agricultural Machinery.

Italy 152 582. Automatic anchor-waggon by NANNI and MELANDRI for mechanical cultivation.
158 299. Tractor for towing ploughs, harvesters, waggons, etc., to replace oxen.
United Kingdom 108 581. Steering mechanism for agricultural tractor.
108 833. Motortractor.
United States 1 237 814. Tractor tread link.
1 237 930. Farm tractor.
1 238 702 — 1 238 752. Tractors.
1 238 732. Traction engine.
1 238 762. Attachable tractor for automobiles.
1 239 147. Draft equalizer.
1 239 328. Tractor engine.

Feeding and Housing of Livestock.

Canada 177 729. Feed box for horses.
Italy 158 445. Utilisation of palm nuts and seeds for feeding of livestock.
United States 1 237 606 — 1 237 784 — 1 238 093 — 1 238 000. Hog oilers.
1 238 212. Hog feeding device.

Aviculture.

Canada 177 577. Feather picking machine.

ited Kingdom 108 932. **Means** enabling fowls to open the door of the poultry house.
ited States 1 237 345. **Egg-carrier.**

Apiculture.

ited States 1 237 741. **Honey section.**

Industries Depending on Plant Products.

ain 9 724. **Drier for preparing raisins.**
9 782. **New apparatus for improving alcoholised wines.**
ited States 1 237 528. **Fruit-pitter.**
1 237 623. **Process of pealing peaches or other fruits or vegetables.**
1 237 708. **Rice-popping machine.**
1 237 874. **Drier for alimentary paste.**

Industries Depending on Animal Products.

itzerland 76 099. **Process for utilising slaughter house offals.**

Dairying.

ada 177 694. **Churn mechanism.**
177 821. **Milk bottle holder.**
mark 22 358. **Cover for milk can.**
itzerland 76 051. **Device for holding a cow's tail during the milking.**
76 091. **Churn device.**
ited Kingdom 108 876. **Press for cheese, etc.**
ited States 1 237 363. **Cream box.**

Farm Buildings, etc.

ada 177 419. **Wire stretcher.**
ited States 1 237 731. **Sliding door.**
1 237 774. **Form for constructing concrete silos.**
1 237 835 — 1 237 851. **Gates.**

Various.

ada 177 695. **Oil can.**

212 - **The Construction of Pit Silos** (1) **in the United States.** — PRYSE, METCALFE, T., and SCOTT, GEORGE, A., in *United States Department of Agriculture, Farmers' Bulletin* No. 825, pp. 14, figs. 6. Washington, 1917.

Pit silos are becoming common in many sections of the Great Plains region of the United States, where wooden silos weaken rapidly owing to the peculiar weather conditions obtaining there. The farmer with the help of his ordinary farm hands can construct a pit silo fairly cheaply.

The site chosen should be in firm, well drained soil. The cylindrical type is the one usually chosen. The depth of the silo depends on the quantity of silage to be stored, but rarely exceeds 30 feet. The walls are plastered about one inch thick with mortar made of one part cement and 2 or 2½ parts of clean, sharp sand. The bottom is left bare. A concrete curb is made before digging the pit, a 4 ft. wall being afterwards built on it; concrete, brick, tile blocks, etc, may be used. A hoisting apparatus is mounted over the silo to provide for easy and rapid removal of the silage.

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1 See *B.*, 1911, No. 3225; *B.*, 1912, No. 391; *R.*, 1916, Nos. 333 and 425; *R.*, March 17, No. 284. (*Ed.*)

The bulletin summarised describes the construction of these silos, t method of digging out the soil, the choice of site; it indicates the dimensio (2 tables) and gives details regarding filling, removing the silage for feedi cautions against poisonous gases in the silo and the construction of a cov A number of figures clearly illustrate the information given. At the e of the bulletin a list is given of all the bulletins previously published by t U. S. Department of Agriculture with regard to silage and the constructi of silos.

RURAL ECONOMICS.

1213 – **The Method of Valuation of Real Estate; Part II: Its Application to Agricultural and Forest Valuations.** — SERPIERI, ARRIGO, in *Estratto degli Annali del R. Istituto Superiore forestale nazionale* (Vols. I and II), pp. 32-196. Florence, 1917.

The first part of this work on the methods of valuation of real est was summarised in the January, 1917 number of this *Review* (No. The second part, which deals with the application of the methods previou studied to agricultural and forest valuations, forms the object of the pres bibliographical note.

Chapter III, the first of the 2nd part, is a discussion, raised by AEREBOE treatise on valuation, on the question of the substitution of the synthet for the analytic method of valuation. Paragraph 18 shows the usefu ness of the analytic method for valuations whose aim is other than a know ledge of market prices. The following paragraphs are devoted to this la ter end: paragraphs 19-23 examine the difficulties of the application the analytic method, the possibility and means of overcoming them. Spec mention must be made of paragraph 20, which deals with the *statistic* determination of the rate of capitalisation, and paragraphs 22-23, wh discuss the application of the analytic determination of farm profits to es mate the means of production *without the market prices*, and how to ch between the different technical methods of cultivation.

Paragraph 24 sets out the difficulties of applying the synthetic meth and the appendix discusses particularly this method as proposed by AEREB The conclusion is contained in paragraph 25, which shows that, in the est mation of market prices, both the synthetic and analytic method have a fie of application peculiar to themselves, for which the modalities are specified

Paragraph 26 shows that the estimation of market prices (by what ever method) always presumes statistical research into the effective buyi and selling prices of real estate.

In chapter IV are discussed the most controversial points in fore valuation. In paragraphs 29-30 are condensed to a small number of type the numerous and varied formulae given by various authors for the capita isation of forest revenues. Pararaphs 31-32 solve two of the most dispute points: 1) whether, as many authors maintain, the capitalisation of revenu from forest land should be lower than that from agricultural land; 2) wh

ther this capitalisation should be based on the corresponding cycles of financial management ("turno finanziario") (1).

Paragraphs 35-36 are devoted to the estimation of the market price of woods; they show the difficulties essentially inherent to the slight mobility of such real estate, and the resulting impossibility of useful statistical research into the prices. An estimation of the probable market prices may even be impossible, but there always remains the possibility, by the capitalisation of the revenues, of judging the relative advisability of investing savings in buying a specified wood.

Among the other paragraphs, in which the numerous valuation methods proposed by various authors are closely examined and criticised, the last two, dealing with the difficult problem of the valuation of selection forest ("fustaie da dirado") must be mentioned particularly.

1214 - **The Cost of Producing Apples in Western Colorado** (2). — THOMSON, S. U. and MILLER, G. H., in *U. S. Department of Agriculture (Office of Farm Management) Bulletin* No. 500; pp. 1-44. Washington D. C., March 14, 1917.

The study of apple production discussed in this bulletin, the second of a series of bulletins on the cost of apple production (3) was made during the years 1914 and 1915 in the Grand Valley and adjacent districts of Western Colorado. This area was chosen as being representative of a region which is not only of great present commercial importance, but has a large acreage of young orchards not yet in bearing. All apples are grown under irrigation, principally on comparatively small farms.

The data presented were obtained through detail studies of the orchard practices of 125 representative apple growers, 49 of whom were located in Mesa County, 61 in Delta County and 15 in Montrose County.

The factors considered in arriving at the annual cost of apple production have been classified as follows :

Labour		Costs other than labour	
Maintenance	Handling	Material costs	Fixed costs
Manuring	Hauling box shooks	Box shook	Taxes
Pruning	Making boxes	Nails	Insurance
Burning of brush	Hauling loose boxes out	Paper	Water rent
Ploughing	Picking	Labels	Equipment charge
Cultivating	Hauling full boxes in	Spray materials	Machine hire
Irrigating	Sorting	Manure	Interest
Thinning	Packing	Gasoline, oil, etc.	Building charge
Spraying	Nailing		
Miscellaneous.	Other packing labour		
	Haul to station		

1) On this subject see *R.*, 1914, No. 845.

2) See *R.*, February 1916, No. 224.

(3) Cfr. *U. S. Dep. of Agric. Bulletin* No. 446: The Cost of Producing Apples in Wenatchee Valley, Washington, and *Bulletin* 518: The Cost of Producing Apples in Hood River Valley, Oregon. (*Ed.*).

It was found that the total cost of production for the 125 farms p presenting the entire region averages $ 0.844 per box. Labour co average $ 0.394 per box and $ 111.88 per acre (46.7 % of the total cos Material and fixed costs (manure, spray materials, etc.) average $ 0 per box and $ 127.91 per acre (53.3 % of total cost). Of this cost p principal item is intérest on investment in orchard, which is $ 0.184 box, or 21.8 % of the total cost. The average yield for the district 284 boxes per acre ; 3.8 per tree. The trees in orchards studied avera 17 years of age and 74 to the acre. Jonathan is the leading variety, wi Ben Davis, Rome Beauty, Gano, and Winesap following, each of abo equal importance.

Conclusions. — Averages secured in this study seem to warrat the following conclusions as to fruit farming in the Grand Valley an adjacent districts :

The majority of farms are not sufficiently diversified to secure th best results ; the farms studied were prosperous in direct proportion t the degree of diversification practiced. Orchards must be set in suitab and well drained soil. Clean cultivation can not be practiced indefinite without depleting the soil seriously. Humus should be supplied either the form of manure or by using cover crops. In general it seems inev table that fruit growers must find important supplemental sources income to tide them over years of low fruit prices. Fruit growing co bined with general farming will probably be more successful financial than fruit growing alone.

AGRICULTURAL INDUSTRIES.

1215 – **Unripe Grapes in Wine-Making in the Argentine.** — GALET, GIACOMO, in the "... *nale Vinicolo italiano*, Year 43, No. 40, pp. 472-473. Casale Monferrato, October 7, 1...

Following on experiments made by M. PIERRE CASENAVE at Mendoz on the use of unripe grapes in wine-making in the place of tartaric acid, an published in 1916, the writer describes his experiments, which lead to th same conclusions as those of M. CASENAVE.

Towards the middle of January 1917 (a period corresponding, in th southern hemisphere, to our summer), the writer gathered green grapes an dried them in the sun. Part of the juice was expressed ; the acidity this juice was 24 degrees, expressed in terms of tartaric acid. Expos to the extremely hot sun, the writer considered the grapes to be ready f use after 7 days, when they were crushed in a small mill; 100 kg. of unrip grapes yielded 14.5 kg. when dried.

In the first days of March, ripe bunches of the *Criolla* variety wer gathered ; they gave a density of 12 ½ Baumé and a total sulphuric acidity of 2.695 %oo.

To this must, 13 grm. of dried, crushed grapes were added per litr 8 days after, the clear liquid was drawn off ; the alcohol was found to h 13.800, the acidity 4.700, and the volatile acidity 0.60 per thousand

To increase the *total acidity* in H_2SO_4 by one degree in the must, 6.5 grm. of dried grapes were required per litre, or 650 grm. per hectolitre, equivalent to 5.520 kg. of acid grapes.

As ripe grapes cost 5 *centavos* the kg. that year, the cost per hectolitre and per degree of acidity was, in round figures, 30 centavos. With European tartaric acid, which now is very expensive, the corresponding cost would have been 50 centavos.

The author concludes, like M. CASENAVE, that the use of unripe grapes in the place of tartaric acid would, because of the over production of wine and grapes in the Argentine, result in a national economy of about 3 million francs in that country.

1216 – **The Reduction in Volume of the Must During Fermentation** (1). — BORNTRAEGER, A., in the *Giornale vinicolo italiano*, No. 26, pp. 302-304; No. 37, pp. 436-437. — DE ASTIS, G., *Ibid.*, No. 29, p. 340; No. 42, pp. 496-497. Casale Monferrato, 1917.

After the account of the experiments of M. DE ASTIS who, in his calculation of the decrease in volume of the must in fermentation, started from glucose, M. BORNTRAEGER shows that, according to his own calculations, starting from saccharose, he has obtained different results, in that not only no decrease in volume has taken place, but he has observed a slight increase in volume owing to chemical changes. He consider the formula of M. DE ASTIS and adds that the practical experiments of that author, made with filtered Tuscan must, showed an actual decrease of 0.345 and 0.310 %, figures which are intermediate between those obtained by M. DE ASTIS and himself.

M. DE ASTIS does not accept M. BORNTRAEGER'S results and is of the opinion that he has made a mistake in his calculations in assuming that 100 grm. of saccharose in 10 or 20 % solution would occupy a volume of 55 cc. while the true volume is 63.23 cc.

After M. BORNTRAEGER has replied, defending his point of view, M. DE ASTIS insists on his opinion, using as support that of M. MANOURY (President of the *Association des Chimistes de Sucrerie et de Distillerie de France et des Colonies*), according to which the volume in question is 64.702 cc., a figure close to his own.

During the discussion, M. DE ASTIS corrects the formula that he had given for calculating the diminution in volume, namely:

$$C = \frac{Z}{1.613} - ad - a \times 0.0080;$$

in which C is the decrease in volume, Z the number of grams of sugar in 100 cc. of the must, 1.613 the density of glucose at 17.5° C., a the % volume of alcohol in the wine, and 0.0080 the index of contraction for each litre of alcohol.

Through further research, M. DE ASTIS has been brought to modify the value of the index of contraction. In fact, when 53.0 cc. of alcohol are mixed

(1) See *R.*, July 1917, No. 667.

with 49.8 cc of water, the contraction is as 3.70 is to 103.70, corresponding to 3.586 %. The index is therefore :

$\frac{3.586}{5.9} = 0.0662$, and the formula becomes ;

$$C = \frac{Z}{1.613} - [(a - (a + 0.0662)].$$

1217 – **Contribution to the Study and Treatment of the "Casse Blanche" of Wines.** — MORRAU, L. and VINET, B., in the *Bulletin de la Société des Agriculteurs de France*, September, 1917, pp. 267-271, and October 1917, pp. 292-299. Paris, 1917.

The writers describe the disease of white wines called "*casse blanche*" and treat of its history, specially considering the latest work on this subject.

Since 1907, the writers have examined a number of well defined cases of casse blanche, and the examination of these diseased wines has led them to carry out researches on the subject, with the idea : 1) of ascertaining the exact part played by *iron* and *phosphoric acid* in the disease ; 2) of studying the influence of the composition of the wine and of aeration on casse blanche and finding out the conditions under which the two related diseases, "*casse bleu*" or "*tanno-ferric*", and "*casse blanche*" or "*phosphoferric*" are produced ; 2) of ascertaining the best treatment for preventing casse blanche.

I. — PART PLAYED BY IRON AND PHOSPHORIC ACID. — The writers' experiments have led to the conclusion that casse blanche is in relation with the *iron salts* and *phosphates* in the wine. Any increase of iron (contact with storage utensils, especially with rusty iron) and phosphoric acid (*e. g.* addition of ammonium phosphate) in the wine may cause casse blanche.

II. — INFLUENCE OF THE COMPOSITION OF THE WINE AND OF AERATION. — A) PART PLAYED BY THE ACIDS OF THE WINE AND POTASSIUM BITARTRATE. — 1) *Action of tartaric acid.* — The free tartaric acid of the wine has a very favourable reaction as regards the disease which explains why casse blanche is particularly common in the northern vinegrowing regions and in years of high acidity, that is, of incomplete maturity, when the wines are rich in free tartaric acid, and which explains why deacidified wines are practically always free from casse blanche. Deacidification, in fact, chiefly acts on the tartaric compounds ; on free tartaric acid only, if the neutral potassium tartrate is used ; on tartaric acid and the bitartrate, if calcium carbonate is used.

2) *Action of potassium bitartrate, malic acid and succinic acid.* — The favourable action of these acid substances, even when added simultaneously, is much below that of tartaric acid.

3) *Action of citric acid.* — The writers' tests confirm and amplify previous knowledge on the function of citric acid, which is : *a*) that this acid used in the legal amount of 0.5 grm. per litre is not always sufficient to prevent the appearance of casse blanche ; on the other hand, the use of 1 grm. per litre always prevents it ; *b*) that, in diseased wines, even when 1 grm.

(1) See also *R.*, April 1917, No. 367 (*Ed.*).

per litre is used, the citric acid does not always successfully dissolve the precipitate formed, but helps the agglutination and deposition of the ferric phosphate in suspension.

4) *Influence of tannic matter ; casse blanche and casse bleue.* In a wine affected with casse blanche, the tannin perceptibly adds to the extent of the disease and modifies it to a bluish colour ; this special casse blanche should not be confused with the casse bleue, where the precipitate contains no phosphoric acid or only traces ; in this case the mineral composition of the precipitate is unchanged.

B) INFLUENCE OF AERATION. — Aeration favours casse blanche on account of the purely chemical function of its oxygen ; the phosphoric acid and the iron of the wine combine to form a ferrous phosphate, the wine being, by reason of its affinity for oxygen, a reducing medium ; this ferrous phosphate, during the aeration of the wine that always takes place during wine-making, oxidises slowly, forming ferric phosphate which is only slightly soluble in wine ; the casse blanche precipitate may then appear.

III. — **TREATMENT OF CASSE BLANCHE.** — The disease can be prevented, or cured, in two ways, according to the case : 1) by treating wines of average, or less than average, acidity with citric acid ; 2) by treating "green" wines with *deacidifying* agents. In the latter case, it must not be forgotten that preventive treatment is much more desirable, and it affords still another reason for advising the deacidification of musts in years of high acidity.

1118 - **The By-Products of Alcoholic Fermentation.** — LINDET, J., in the *Bulletin de l'Association des Chimistes de Sucrerie et de Distillerie*, Vol. XXXV, Nos. 7-9, pp. 232-236. Paris, January-February, 1917.

Commissioned by the Powder Department to specify the economic conditions under which foreign brown sugar, deprived of its food substances for yeast, is capable of supplying alcohol on distillation, the author sought to discover whether the by-product of alcoholic fermentation (observed by PASTEUR and estimated by him at about 6 % of the sugar, represented by glycerin, succinic acid, higher alcohols and by the excretion products of the old globules, even, at times, by yeast itself) is perceptibly constant or varies with the difficulties met by the yeast in forming and maintaining itself, in consequence of the value of the food with which it is supplied.

The author admits that all which is not alcohol and carbonic acid corresponding to GAY-LUSSAC's formula, all which is not formed by the zymasic action of the yeast, is a by-product derived from the life activities of the globules. He does not calculate this by-product as an absolute value, but expresses it per unit of yeast obtained.

His experiments, which he describes, led to the following conclusions:

Saccharose is a bad food for yeast, and, in its presence, ammoniacal salts change into proteins with great difficulty. This is not the case when more assimilable carbohydrates are added to the sugar ; the synthesis of the proteins becomes almost as easy and as rapid as if a ready-formed protein had been added to the yeast. The by-product per unit of yeast obtained, as defined above, may thus be used to measure the value of the

food supplied to the yeast. It is more abundant in proportion as the amount of yeast obtained is smaller, i. e., the efforts of the yeast to effect the synthesis of its carbohydrates are greater, in other words as the value of the food decreases.

1219 – **Inversion of the Saccharose in Cane Sugar under the Influence of Microorganisms, at Java.** — AMONS, W. J. TH., in *Archief voor de Suikerindustrie in Nederlandsch-Indië*, Year 125, Pt. 29, pp. 1225-1231, Soerabaja, 1917.

It has long been known that certain microorganisms invert the saccharose in cane sugar. This action has been attributed by some workers to bacteria, by others, to the presence of *Penicillium glaucum*.

The author was able to study this problem in samples of cane sugar which had become hygroscopic after packing. By making agar-agar cultures he was able to isolate from these samples various fungi, among others: — *Aspergillus niger*, *A. fumigatus*, *A. flavus*, *A. clavatus*; *Penicillium glaucum*, *P. purpurogenum* (Stoll); *Rhyzopus*.

In order to demonstrate the injurious action of these microorganisms a sugar from the same source, still normal at 110° C., was sterilised, half was infected with the spores of the fungi, the whole lot covered and placed under a bell jar in which the moisture was kept equal to that of a saccharose solution at normal temperature.

When the mycelium develops and forms invertase, the saccharose is changed into glucose and fructose, more hygroscopic than saccharose. By determining the weight of the infected and uninfected sugar at regular intervals it is possible to follow the progressive action of the fungi on the sugar. The samples on which the fungi have acted weigh more on account of their high moisture content.

Up to the 8th. day all the samples, whether infected or not, increased in weight as a result of the condensation of water on their surface in the moist atmosphere in which they had been placed.

After the 8th. day the infected sugar increased in weight, whereas the other samples did not change.

After the 14th. day fungi had developed in all the samples and it was no longer possible to control the results of the experiment.

Another experiment, carried out with a pure culture of *Penicillium glaucum* under completely sterile conditions, gave similar results.

From this it seems that *Penicillium glaucum* alone is capable of splitting sugar. The inversion depends on the quality of the sugar, the moisture etc. It is probable that other microorganisms have a similar action under conditions favourable to their development.

1220 – **The Use of Chestnuts in Breadmaking.** — I. DE MARCILLAC. II. LINDET. III. MANGIN, LOUIS, in *Comptes rendus des Séances de l'Académie d'Agriculture de France*, Vol. 3, No. 32, pp. 942-947. Paris, October 24, 1917.

I. — M. DE MARCILLAC, after giving the composition of the chestnut according to WOLFF and pointing out its high food value, states that M. DE ROUX, an agriculturist of Haute-Vienne, mixed chestnut flour with wheat flour in the proportion of 1: 2. He thus obtained an excellent bread, which

wever, should be salted rather more than ordinary bread to attenuate e taste of the chestnut.

Two objections may be raised to the use of chestnuts in breadmaking: the question of decortication and that of labour. The skin, however, e weight of which varies from 15 to 20 % of the weight of the chestnut, r 1/5 th. of the total weight, comes off of itself when the fruit is dried; rubing and energetic winnowing suffice to free the edible parts from any partles which may adhere to them; as, for use in breadmaking, it must ways be ground and made into flour, the difficulty is easily overcome.

The labour question for the harvest could easily be mastered by emloying schoolchildren.

II. — M. LINDET is of opinion that, to use chestnuts for breadmaking, is sufficient to dry the fruit till the skin comes off of its own accord, and grind the chestnuts thus decorticated into flour. The baker would then ave no more difficulty in mixing it with wheat flour than he has when usg barley or maize flour. Chestnut flour is, therefore, desirable as a subitute for cereals in breadmaking.

III. — M. LOUIS MANGIN points out that chestnuts easily spoil and are ery difficult to keep. When dried in an oven by methods which are often primitive they always have a bad taste. They are often attacked by a ungus which soon blackens the flesh and turns the flour bad. It is not ways easy to distinguish healthy fruit from diseased fruit.

Answering this point M. DE MARCILLAC said that he did not believe e chestnut was attacked by this disease while still on the tree. In order to diagnose this disease in Limousin, the chestnuts are plunged into ater and stirred frequently for 4 or 5 days; all those which rise after is operation are bad.

21 - **Preparation and Fermentation of cacao in the Philippines.** — See No. 1160 f this *Review*.

22 - **The Estimation of Rubber in Latex.** — See No. 1207 of this *Review*.

23 - **On the Formation of "Eyes" in Emmenthal Cheese.** — CLARK, W. M., in *Journal of Dairy Science*, Vol. 1, No. 2, pp. 85-111. Baltimore, U. S. A., July, 1917.

A review of the literature by the writer reveals little or no evidence at the eyes of Emmental cheese are strictly localized at points of excesve bacterial growth. On the contrary, the evidence of bacterial counts, of direct microscopical examination, as well as the gas production of fferent regions of the cheese, indicate a more or less uniform distribution the eye-distending gas.

Certain theoretical considerations are presented which lead to the pothesis that the gas separates in aggregates according to the laws verning the separation of gas from supersaturated aqueous solutions. is hypothesis has been tested upon viscous media with results directly plicable to the "eye" and "Nissler" hole formation in cheese. It is cluded; — that the gas produced in Emmental cheese separates in ggregates whose localities have no necessary relation to the points where e gas is produced; that a rapid gas production must tend to the formation

of numerous small holes, while a slow gas production must admit the fc mation of larger holes. This conclusion is shown to agree with the fa that Nissler holes are produced by a rapid fermentation, while eyes a formed slowly. This conclusion also suggests that the gas of Niss holes must separate at numerous points near its point of origin witho regard to any particular locality of the cheese, while the eyes must for at favourable points.

This was experimentally verified by a study of stained cheeses.

1224 – **Estimation of Water in Cheese.** — See No. 1200 of this *Review*.

1225 – **The Present Economic Superiority of Pork over Beef.** — See No. 1184 of th *Review*.

1226 — **The Fish Canning, Guano and Oil Trade in British India.** — See No. 11 of this *Review*.

1227 – **The Handling and Storage of Apples in the Pacific North West.** — RAMSEY, J., MC KAY, A. W., MARKELL, E. L. and BIRD, H. S., in *U. S. Department of Agricul'n Bulletin* No. 587, 32 pp. + 7 coloured plates. Washington, September 8, 1917.

During the seasons 1911-1912 to 1914-1915, inclusive, extensive inve tigations were conducted by the United States Department of Agricultu to determine those factors which are of the greatest importance to the su cessful cold storage of the apples of the Pacific Northwest. For this pu pose, apples were secured from the various more important apple-growin sections of Washington, Oregon, Idaho and Montana.

The experiments conducted at 32° F (0° C.) storage showed: A wi range in the cold-storage keeping qualities of different varieties, dependi upon the decay, skin blemish, texture changes, etc., which they develo

A 2-weeks' delay between the picking and storage of apples oft greatly reduces their keeping properties through more rapid ripening a the development of scald, Jonathan spot, scab (due to *Venturia inaequa* and V. *pomi*) and decay.

A temperature of 32° F will keep apples longer and in better conditi than will a 35° F temperature, the difference in favour of the former i creasing with the time in storage.

Immature picking results in severe scald and early decay of apples storage.

The storage of over-mature apples is equally bad, or worse, than t storage of immature apples, resulting in more rapid deterioration than w those picked and stored at proper maturity.

Well-coloured portions of the skin seldom, if ever, develop scald.

Carelessness in handling is responsible for considerable decay of app in storage, and freedom from bruises and skin abrasions is fundamental successful storage.

Apples from orchards badly infected with northwestern anthracnos are likely to decay early in their storage life.

In conclusion, it is pointed out that successful cold storage of apple is as much the result of the treatment they receive before being placed i

old storage, as of the conditions and temperatures under which they are kept in storage. The responsibility rests as much with the producer and handling organisations as with the cold-storage warehousemen.

1218 - **Report of the Committee on Statistics of Milk and Cream Regulations of the Official Dairy Instructors' Association of the United States.** — In the *Journal of Dairy Science*, Vol. I, No. 1, pp. 45-83. Baltimore, U. S. A., May, 1917.

This survey of the milk and cream regulations of the cities and towns of the United States, includes 194 headings and sub-headings pertaining to laws and ordinances designed to regulate the production, care and sale of milk and cream and presents a mass of statistics of particular interest to all persons interested in this problem.

The order in which the different arguments are discussed is the following: Permits of licenses; Chemical composition; Bacteria; Temperature: Specific gravity; Conditions which render Milk Unsalable; Pasteurization; Tuberculin testing of cows; Stables; Stable Yards; Water Supply; Milkers; Milk house; Milk utensils; The Scoring of Dairy Farms; City Milk plants; Delivery waggons; Labeling and sale; Penalties.

Out of this survey of milk and cream regulations of the cities and towns and states of the United States, the committee has concluded that:

1) there is a great and urgent need that the definite information now available should be placed in the hands of those who are responsible for the laws and ordinances governing the production, transportation, handling and sale of milk; and

2) there is a great and urgent need for further research and study on the part of dairy investigators of some of the problems involved in the production and handling of milk.

PLANT DISEASES

DISEASES NOT DUE TO PARASITES OR OF UNKNOWN ORIGIN.

1229 – **Experiments on Potato Leaf Curl, in France** (1). — BLANCHARD and PERRET, *Comptes rendus des Séances de l'Académie d'Agriculture de France*, Vol. III, No. 31, pp. 805. Paris, 1917.

The experiments, carried out in 1914 in the Department of the Loir do not permit the cause of this disease to be diagnosed with certainty. the most they prove that, if there be parasitism, infection take neither through the soil nor through the skin of the tuber. The inve gations must be continued another year.

Numerous observations made on extensive crops seem to point the fact that leaf curl is a purely physiological disease. The disease appe to show a kind of degeneration in certain varieties of potatoes, due to cessively prolonged asexual reproduction, too frequent replanting in t same soil, cultivation in soils containing sufficient potassium but too nitrogen (the element which favours the development of the leaves) seems to prove that the plant is suffering from nitrogen starvation, rather, that it has difficulty in assimilating this element.

From a practical point of view of it should be noted: —

1) That all varieties are not equally subject to the disease;

2) That all plants of the same variety are not equally attacke

3) That fresh seed and nitrogenous manure diminish the dise

Therefore, until an efficacious remedy is found, it is advisable: —

1) To grow the most resistant varieties in each district ("Violet d'Auvergne", "Andréa", "Fluck géante", "Saucisse rouge", in central Massif district);

2) to renew the seed potatoes frequently; in the Loire distri especially, seed potatoes introduced in large quantities from the west. ha given the growers entire satisfaction;

(1) On this subject see: *B.* Jan. 1911, No. 280; *B.* Feb., 1911, Nos. 591 and 622; *B.* 1911, Nos. 1881 and 2029; *B.* April, 1912, No. 728; *B.* June, 1911, No. 580; *B.* July, No. 683; *B.* Sept., 1911, No. 858; *B.* April, 1915, No. 360; *R.* May, 1916, No. 558; *R.* Aug 1916, No. 851; *R.* June, 1917, No. 512.

3) to select, at harvest times, good varieties; in other words, to choose he spring seed potatoes from the most productive and strongest plants;

4) to give the plantation a minimum of 220 cwt. of well prepared rmyard manure;

5) to apply the nitrogen treatments late.

Copper treatment, so efficacious against mildew, has no effect on leaf rl.

130 - **New Disease of the Pineapple in the Philippines.** — MACKIE, D. B., in *The Philippine Agricultural Review*, Vol. X, No. 2, p. 150, pl. XVII. Manila, 1917.

In the Philippines at Binan (prov. of Laguna) and at Pinelands (prov. of ueva-Ecija) a disease has appeared on varieties of pineapple known as mooth Cayenne and Queen which, should it spread, might seriously threaten e pineapple industry. The disease causes a hypertrophy of the tissues, hich gives them a rough corrugated appearance. It has also been noticed at the suckers prepared for shipping which show these same corrugations ten develop a heart rot, causing the whole heart to become shiny and easily illed out. This rot has been observed on about 10 per cent of the suckers hich also showed the corrugations.

In Hawaii (islands of Kauai) and Oahu there is a disease of pineapples hich has been subjected to local quarantine. This disease is believed be the same as that now recorded in the Philippines.

Affected plants should be pulled out and burnt, also particular care ould be exercised that no infected suckers are used for distribution or opagation.

131 - **The "Little Leaf" Disease of the Vine in California.** — BIOLETTI, FREDERIC T. and BONNET, LEON, in the *Journal of Agricultural Research*, Vol. VIII, No. 10, pp. 381-307, fig. 1-2, pl. 80-92. Washington, D. C., 1917.

A disease of the vine (*Vitis* spp.) known variously as "little leaf", curly-leaf", and "yellow-leaf", first attracted attention in California bout the beginning of the century. Some growers claim to have noticed t earlier, but no printed reference has been found that points clearly to his disease before 1900. Most of the vines in many districts where it is revalent have been planted since that date.

At present, many vines are attacked in various regions from the borders f Sacramento and San Joaquin Counties, to the southerly end of the San Joaquin Valley. No indubitable cases have been noted in the Sacramento alley, south of Kern County or in any part of the coast region. The total rea attacked is difficult to estimate, but it is large. In some localities, nly occasional vines, or small spots are affected, in others, most of the vines how more or less intense symptoms. The loss in crop is large, and equally ifficult to estimate.

The disease seems to be unknown elsewhere, unless a form of "court oué", noted in Northern Mexico and Southern Europe, is identical.

Affected vines show small yellowish leaves, short-jointed canes, and in evere cases, dead spots on the leaves and gummy secretions in the conduct-ng tissue of the arms and trunk. In severe cases, the vines die after a few

years. Vines slightly affected set fruit imperfectly, and those badly affe ed bear little or nothing.

No parasite has been found connected with the disease, and the e dence seems to show that it is not infectious. Everything seems to poi to the malady being due to local conditions of soil, water, temperature, other non-parasitic causes.

The disease has been noted on various species of *Vitis* and none proved immune. It has been found on the following phylloxera-resista stocks: Riparia gloire de Montpellier, Rip. grand glabre, Rupestris St Geor *Vitis aestivalis*, *V. Champini*, *V. Doaniana*, Berlandieri × *Riparia* 157-, Rip. × Rup, 101-14, 3306, 3309, Rip. × Cord. × Rup. 106-8, Sol × Ri 1615, 1616. All varieties of *Vitis vinifera* are attacked, but a few seem be peculiarly susceptible, and a few others to have some considerable degr of resistance. The Mataro is so badly affected, as to make a class by itse although the Carignane is almost as bad. Examples of partial resistan have been noted with Black Prince, Burger, Sultanina, Valdepeñas, Pet and Alicante Bouschet. Vines belonging to the varieties Muscat, Toka Palomino, Feher Szagos, Zinfandel, Malaga, Green Hungarian and Grenac have been found badly infected in considerable quantities. Grafted vin seem to be as susceptible as vines on their own roots.

Several kinds of trees are attacked by what seems to be the same trou le. *Populus monilifera* var. *angulata* appears particularly susceptible; t same may be said of the apricot. Other trees (peach, walnut, almon fig. *Melia Azedarach* var. *umbraculiformis*) show similar symptoms, but t resemblance to the affection of the vine is less marked than in the case *P. monilifera* var. *angulata* and the apricot.

No effective method of treatment has yet been found; though an exper ment carried out under the direction of the California Agricultural Exper ment Station on a small vineyard of 176 old Tokay vines, of which the ha were severely infected, and the others healthy or slightly affected, show that the application of gypsum to the soil is beneficial to plants sufferi from " little leaf ".

DISEASES DUE TO FUNGI, BACTERIA AND OTHER LOWER PLANTS.

1232 - **Plant Diseases Recently Observed for the First Time in Canada.** Gussow H. T., in *Science*, New Series, Vol. XLVI, No. 1189, p. 362. Lancaster, Pa., 1917

Two cryptogamic plant diseases have recently been observed in t Dominion of Canada which have not been recorded before: *Dothich populea* Sacc. and Briard on *Populus nigra* var. *italica* at St, Andre (New Brunswick), and *Colletotrichum cereale* Manns on spring wheat. Ch lottetown (Prince Edward Island).

A third disease affecting seed pods of turnips grown for seed in Pri Edward Island caused by *Leptosphaeria Napi* (Fuckel) Sacc. of which the

l form, *Sporidesmium exitiosum* Kuhn was found, does not appear to been recorded as causing trouble on the continent of America. It is known in Europe, where it is disastrous to seed turnip (*B. rapa*) ires.

- **Myxomycetes and Fungi of Piedmont, Italy** (1). — NOELLI, ALBERTO, in *Nuovo iornale botanico italiano*, New Series, Vol. XXIV, No. 3, pp. 183-197. Florence, 1917.
Ten species of myxomycetes and 101 species of fungi properly speaking enumerated. All were collected at different times by different people, cially in the mountain and hill districts of Piedmont.
Four species are new, amongst them *Lachnella Cerasi*, on the bark of nus *Cerasus* at Levone Canavese, November 1912, and *Cladosporium inum* on the branches of *Acer Negundo* (*Negundo aceroides*), at Bruere oli), March 29th., 1915.

- **Fungi of North Dakota, United States of America.** — BRENCKLE, J. F., in *Mycologia*, Vol. IX, No. 5, pp. 275-293. Lancaster, Pa., 1917.
In this list, an attempt is made to bring together all known North Da- a fungi mentioned in earlier lists and papers, as well as those collected ing the past 7 years.
The list mentioned above contains the names, arranged in alphabeti- order, of 22 phycomycetes and 271 ascomycetes.
The data accompanying the specific names relate to the host-plants or stratum, the locality and the date of collection: the name of the collector also given, unless in the case of species found by the writer himself.

- **Swedish Varieties of Winter Wheat Resistant to Rust, Lodging and Cold.** — See Nos. 1146-1147 of this *Review*.

- **Wild Hops of the United States Resistant to Disease and Climatic Changes.** — See No. 1142 of this *Review*.

- **Tables Grape Hybrid Bearers Resistant to Disease.** — See No. 1169 of this *Review*.

- **Hybrid Direct Bearers Resistant to Fungous Disease, in Seine-et-Marne, France.** — See No. 1170 of this *Review*.

- **The "Madone" Vine Resistant to Mildew and Oidium, in Aude, France.** — See No. 1171 of this *Review*.

- **Chinese Chestnuts (*Castanea mollissima*) Resistant to Bark Disease.** — See No. 1129 of this *Review*.

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(1) See also *B.* Nov.-Dec., 1911, No. 3:21; *B.* Sept., 1912, No. 1351; *B.* Nov., 1912, 1573; *B.* July, 1913, pp. 1000-1005; *B.* June, 1915, No. 650; *B.* Sept. 1915, No. 984; Feb. 1917, Nos. 191 and 205; *R.* July, 1917, Nos. 680 and 686-687. (*Ed.*).

1241 – ***Fusarium coeruleum* the Cause of the Dry Rot of the Potato Tuber in British Isles** (1). — PETHYBRIDGE, GEORGE H., and LAFFERTY H. A., in *The Scientific Proceedings of the Royal Dublin Society*, Vol. XV (New Series), No. 21, pp. 193-Plates VI-VII. Dublin 1917.

The dry-rot of the potato tuber which commonly occurs in the Brit Isles is caused by *Fusarium coeruleum* (Lib.) Sacc. The 2 species, *F. oxyspor* Schlecht, and *F. trichothecioides* Woll., which are largely responsible a somewhat similar type of rot in certain parts of the United States of A rica, have not been met with in this connection up to the present in the B tish Isles.

On a single occasion, *F. arthrosporioides* Sherb. was found, and pro to be capable of causing a dry-rot of the potato tuber. Further researc may perhaps show that this, and possibly some other species of *Fusariu* are occasionally responsible for the production of dry-rot in Britain.

F. coeruleum does not produce hadromycosis of the potato plant, i does it kill the latter by attacking its roots. It can destroy tomato fru but does not attack onions, mangels, carrots, parsnips, or apples.

Infection frequently occurs through mechanical wounds, such as th caused by implements, by bruising and by breaking off the sprouts. It m occur also through scab spots (*Oospora Scabies*). Wounds, however, are essential, for infection can take place through the lenticels, eyes, or you sprouts of uninjured tubers.

Potatoes become more susceptible to infection as they become m mature, hence the rot is more prevalent during the later than during earlier period of storage. Some varieties of potato (Eclipse, Winc Castle and Epicure) are more resistant to infection than others.

Affected tubers cannot be cured, and the application of sulphur lime for preventing infection or retarding the rot, is of no practical val

1242 – **The Control of Canker (*Phytophthora Faberi*) of the Cocoa-tree, Java** (2). — HALL, C. J. J. VAN, in *Mededeelingen van het Laboratorium voor Plan ziekten*, No. 30, pp. 1-10. Batavia, 1917.

In spite of rigorous treatment by the Ceylon method, which cons in a radical cutting of the infected parts of the cortex, a large number of coa-trees of the " criollo " variety in the Kimiri plantations were attac by *Phytophthora Faberi*. The loss, in 1912, amounted to 1000 out of 17 trees in one plantation. From 1912 onwards the method recommended the author has been followed. This consists of a radical pruning of the t Bordeaux mixture treatment, superficial scraping of the cankerous part the stems and the washing of these parts with 20 % carbolineum or vege ble tar. As preventative measure, boring-beetles were fought continual

(1) See also *B.* September 1913, No. 1105; *B.* October 1914, No. 956; *B.* November 19 No. 1070; *R.* October 1916, No. 1129; *R.* November 1916. No. 1232; *R.*, February 19 No. 198.

(2) See also *B.* Jan., 1911, No. 316; *B.* Dec., 1912, No. 1686; *B.* Sept., 1913, No. 1 *B.* March, 1914, No. 285; *B.* Nov., 1914, No. 1072; *B.* Feb., 1915, No. 228; *R.* Oct., 1 No 978; *R.* Nov., 1917, No. 1094. (*Fl*

special staff undertook the pruning, and each tree was visited at least once month.

The results of the treatment were very satisfactory and cocoa-tree can- may be considered as having disappeared from the plantations. In 08-1912 these was an average of 5.4 % of dead trees per annum ; this loss, 1913, was reduced to 2.8 % and, in 1915, to 0.7 %.

1243 - **Diseases of the Sweet Cinnamon Tree (*Cinnamomum Burmanni*), in Sumatra.** — See N. 1161 of this *Review*.

1244 - ***Bacterium Tabacum* Injurious to Tobacco in North Carolina, United States of America.** — WOLF, F. A., and FOSTER, A. C., in *Science*, New Series, Vol. XLVI, No. 1189, pp. 361-362. Lancaster, Pa., 1917.

A bacterial leaf spot of tobacco has been found to occur within certain ctions of North Carolina The disease, commonly known as " wild fire ", anifests itself in seriously destructive form at the time of transplanting, so at in some fields it has been necessary to replace the seedlings by a se- nd and third transplanting. Plants in the seedbeds from which these edlings were taken have been found to be diseased, indicating that the alady was introduced from the seed beds.

The disease first appears as circular yellow spots about 1 cm. in diame- r. A minute brown area indicates the centre of the spot. Within a w days the brown area grows to 2 or 3 cm. in diameter with a translu- ent border surrounded by a wide chlorotic halo. When the spots are nu- erous they fuse, forming large, brown, irregular areas, which in severe ases, involve most of the leaf tissues.

Isolation and inoculation work have shown that the disease is due to a reyish white bacterial organism which is so far undescribed. It is rod- haped, about 3 times as long as wide, and actively motile owing to a sin- le polar flagellum. It is therefore referable to Cohn's *Bacterium* as amend- d by Smith, and is given the name *Bacterium Tabacum*. The detailed ccount of the morpho-biological characters of this microorganism are re- erved for subsequent publication.

1245 - **" Rust" (*Uredo Ricini*) of the Castor-Oil Plant in Morocco.** — ARNAUD, G., in *Bulletin de la Société de Pathologie végétale de France*, Vol. 4, Pt. 1, pp. 37-39. Paris, 1917.

The Plant Pathology Station of Paris received, from the Agricultural Department of Morocco, castor-oil leaves, attacked by *Uredo Ricini* Biv. gathered at Rabat at the beginning of February 1917. The samples were covered with numerous orange-yellow pustules of the fungus, contain- ing uredospores, and there was no doubt that the parasite had caused con- siderable injury to the plant, the cultivation of which, judging by experi- ments already carried out, should, in the future, be very profitable in Morocco.

This rust, known for a long time, has been observed in Europe (Italy, in Piedmont, Liguria, Sardinia and Sicily ; Spain, at Seville, Cadiz, etc ; Portugal), in Asia (India, at Madras) and in Africa (southern Morocco, Me-

lilla, and now, at Rabat; Algeria, near Algiers; Tunis, at Gabes, Egypt, a it seems, in certain districts in the south of the continent).

To reduce the damage caused by the parasite, it seems, above all cessary to find resistant varieties of the castor-oil plant, and to study localities in which the disease spreads least.

1246 – **The Discovery of Urediniae of *Cronartium Ribicola* on Stems of *Ri hirtellum* in Maine, United States** (1). — POSEY, G. B., GRAVATT, G. F., Co R. H., in *Science*, New Series, Vol. XLVI, No. 1187, pp. 314-315. Lancaster, Pa. 191

Recently, urediniae of *Cronartium ribicola* Fischer have been discove for the first time, on the stems of *Ribes hirtellum* Michx. (= *Grossularia tella* [Michx.], Spach.) growing in a pine plantation at Kittery Point (Mai In the same woodlot, 2 other isolated plants of the same species ino lated with aecidiospores by applying the moistened aecidiospores to unwounded green stems developed respectively 1 and 17 stem infections. the 17 infections some were very evidently natural infections, since t occurred at points on the stems where no aecidiospores had been appl

Urediniae were produced on some of the stem infections from the n dle of June until August 20. The uredospores which were formed these sori were apparently normal in every way. In the case of the ot stem infections, where no urediniae appeared, the study of sectioned m rial showed an abundance of mycelium and numerous well-formed inte urediniae in the cortex.

The discovery of sporulating urediniae on *Ribes* stems complicates already difficult problem of detecting the disease on *Ribes*.

In view of the observations recorded above, it must be concluded t no *Ribes* from infected regions can be declared absolutely free from rust, even when completely defoliated. Moreover, the presence of mycelium and internal urediniae in stem tissue is strong evidence that disease does in some cases winter over on *Ribes*.

1247 – **The Treatment of Mildew of the Peach Tree (*Oidium leucoconium*)** SAVASTANO, L., in *R. Stazione sperimentale di Agrumicoltura e Frutticoltura, Acir Bollettino* No. 31, pp. 1-2. Acireale, 1917.

Oidium leucoconium Desm. develops regularly each year in the orcha of western Sicily.

The young peach trees sometimes do not lose their leaves in winter the extremities of the twigs remain green and tender, so that the fun not only hibernates in them, but also prepares the summer reproducti

Peach mildew is not serious in itself, since only the ends of the tv are attacked; but the persistant disease, renewed each year, shortens life of the tree and compromises the bearing of fruit.

Of the remedies, potassium sulphate and lime-sulphur mixture sco the plant. The author's experiments of 1916 showed sulphur to be p ferable. The use of sulphur in this case is only efficacious if applied bef

(1) See also *R.*, June 1917, No. 601.

e mildew has a definite hold on the plant ; the sulphur treatment must repeated each time a new attack by the parasite is to be feared. Sulphur, reover, is beneficial to the growth of the tree.

48 - **Scab (*Venturia Pomi*) and Other Diseases of Stored Apples, in the United States.** — See No. 1227 of this *Review*.

49 - ***Armillaria mellea*, a Basidiomycete Injurious to the Walnut Tree, in France** (1). — GUINIER, PH., in *Bulletin de la Société de Pathologie végétale de France*, Vol. IV, Pt. 1, pp. 27-29. Paris, 1917.

The author had occasion to study a disease of the walnut tree in the epartments of Charente (near Ruffec) and Dordogne (in the district of ontron and Thiviers), where it was very widespread ; he also observed sporadically in Dauphiny and Savoy. The symptoms of this disease, as scribed by the land-owners, consist of a gradual dying off and yellowing the leaves and drying up of the branches, finally ending in the death the tree towards the end of the vegetative season.

At the base of numerous dead or dying trees, under the bark of the main ots, the author noticed the constant presence of rhizomorphs of various pes, white or blackish. The smaller roots are completely rotten. At the t of the dead trees, a short distance away along the line of the roots, are nd groups of fructifications of *Armillaria mellea* Vahl. According to the thor it is this fungus, so common on fruit trees, both as saprophyte d parasite, which is the cause of the disease in question, though agriturists attribute it to meteorological conditions and, sometimes, to the mpness of the soil.

There are practically no means of protecting the walnut against the sease, but certain very simple preventative measures may be applied. rst of all it should be noted that the trees attacked are especially old es, weakened by numerous harvests, and that it is in poor soils, where tle care is given the trees, that the disease is worst. Growers must tend e trees better and counterbalance the exhaustion of the soil by successive nvests by the addition of suitable fertilisers. The resistance of the trees the disease will thus be increased.

In the second place, it is desirable that trees which are dying off comletely be cut down without delay and uprooted with great care instead of ing left standing in the hope that they will regain strength. If left they low the fungus to fructify abundantly and increase the risks of infection healthy trees. Diseased roots especially are left in the soil ; these may me into contact with the roots of neighbouring trees, thus spreading the sease. The danger is particularly great for young trees which are replanted in an impoverished and infected soil.

50 - ***Polyporus amorphus*, Causing a Rot of the Wood of *Pinus rigida*, in Pennsylvania, U. S. A.** — OVERHOLTS, L. O., in *Mycologia*, Vol. IX, No. 5, pp. 261-270, pl. 12-13. Lancaster, Pa., 1917.

Polyporus amorphus Fries cannot yet be considered as a common fungus

(1) See also *B.* Oct. 1914, No. 962 ; *B.* March, 1915, No. 329 ; *B.* Nov., 1915, No. 1211, July, 1917, No. 686. (*Ed.*)

of the United States, as it has been recorded a few times only. It is, h ever, probably much more common than is indicated by existing collecti At present it is believed to be distributed through southern Canada, in ? England and in the States neighbouring on the Canadian border.

According to observations made in the vicinity of State College (Penn vania), this polyporus causes a characteristic rot of the pitch pine (*P. rigida*) ; the fungus has also been observed on white pine (*Pinus strobus*), t mountain pine (*P. pungens*) and hemlock (*Tsuga canadensis*).

Affected wood appears of a darker colour than healthy wood ; it i a light brownish colour.

The spring wood is completely rotted well before the disappearan summer or autumn wood. Thus gives rise to the formation of elongated ities alternating with bands of more consistent summer wood and has gested the popular name of " stringy rot ".

Microscopic and microchemical examination have shown that the gus first dissolves the cellulose of the medullary rays, then the ar points. The lignified structures including the vertical and radial ve are next attacked and finally (in the spring wood, at any rate) compl destroyed.

In consequence, it seems probable that the enzymes that dissolv cellulose are produced in much larger quantity by the young mycel although there is the possible presence of an enzyme that dissolves li

In the later stages of the rot, larger quantities of an enzyme dis ing lignin are produced.

INJURIOUS INSECTS AND OTHER LOWER ANIMALS.

1251 – **The Abundant Occurrence of *Sphinx Convolvuli* in Scotland.** — MAXWELL HERBERT, in *Nature*, Vol. 100, No. 2500, p. 66. London, 1917.

Hitherto *Sphinx convovuli* (the convolvulus hawk-moth) has bee reckoned one of the rarer insects in Scotland. In the last 50 years, the writ has only known of 2 authentic records of its occurrence in Wigtownshir In the autumn of 1917, however, it was very plentiful. One individu came into the author's house at Monteith on September 7 ; 8 others we caught in the neighbourhood of Perth ; 7 more were observed in a gard at Monteith, while hovering round tobacco plants.

It is difficult to account for the sudden appearance of so many of the insects after many years of absence.

1252 – **Insects Injurious to Cultivated Plants in North Africa.** — RIVIÈRE, CH., in *Bu tin de la Société Nationale d'Acclimation de France*, Year 64, No. 10, pp. 401-402. Pa 1917.

The spreading, in North Africa, of certain insects which have becor endemic is a source of anxiety.

Phylloxera infection is increasing, the European vines are rapid dying off and the re-planting of the vineyards with American stock becoming urgent.

The polyphagous coccid *Chrysomphalus minor* Berl. is causing serious injury to oranges and to small-leaved figs, and resists all treatments which, moreover, are difficult to apply to big trees.

The " fruit fly " (*Ceratitis capitata* Wied), at present endemic, damages many fruits (oranges, tangerines, kakis, etc.) (1).

The " olive fly " (*Dacus oleae* Fabr.), in the winter of 1916, so damaged the harvest that, to save part of it, the olives had to be gathered while still green on the Sig (Oran) estate. The same disaster had occurred four years previously.

1153 - **Coccidae of the Philippine Islands.** — ROBINSON, ELIZABETH, in *The Philippine Journal of Science, Section D.: General Biology, Ethnology and Anthropology*, Vol. XII, No. 1, pp. 1-47, Plates I-VI. Manila, 1917.

A systematic description of the following coccids :

1) *Icerya jacobsoni*, Green, in Luzon Island (Laguna, Los Baños), on *Leucosyke capitellata* ;

2) *I. candida*, Cockerell, at Luzon, Manila, on a cultivated tree ;

3) *I. seychellarum* (Westwood), at Luzon, on *Rosa* (Tayabas, Lucban) ; on *Citrus decumana*, *Diospyros Kaki* and *Ficus Minahassae* (Laguna, Los Baños) ; on *Psidium Guajava* (Manila) ;

4) *Drosicha palawanica*, Cockerell, in the Island of Palawan (Puerto Princesa) ;

5) *D. lichenoides*, Cockerell, at Luzon (Laguna, Los Baños), on *Ficus nota* and other trees ;

6) *Monophlebulus townsendi*, Cockerell, at Luzon (Batangas) ;

7) *Llaveia sanguinea*, Cockerell, at Palawan (Puerto Princesa) ;

8) *Ll. benguetensis*, Cockerell, at Luzon (Benguet, Baguio) ;

9) *Ll. luzonica*, Cockerell, at Luzon (Mount Maquiling, and Los Baños) ;

10) *Pseudococcus virgatus*, Cockerell, at Luzon (Laguna, Los Baños), on *Anona squamosa*, *Arachnis hypogaea*, *Caesalpinia pulcherrima*, *Codiaeum variegatum*, *Coffea arabica*, *Graptophyllum*, *Solanum*, *Spondias and Xanthosoma sagittifolium* ;

11) *Ps. virgatus* (Cockerell) var., at Luzon (Tayabas, Lucban), on *Codiaeum variegatum* ;

12) *Ps. tayabanus* Cockerell, at Luzon (Tayabas, Lucban), on *Theobroma Cacao* ;

13) *Ps. lilacinus*, Cockerell, at Luzon (Tayabas, Lucban), on *Citrus nobilis*.

14) *Ps. filamentosus*, Cockerell, on Mindanao Island (Tanghulan), on *Coffea arabica* ;

15) *Protopulvinaria longivalvata bakeri*, Cockerell, at Luzon (Laguna, Los Baños), on *Voacanga globosa* ;

16) *Pulvinaria tyleri*, Cockerell, at Luzon (Batangas), on *Antigonon leptopus* ;

(1) See also *R.* Oct., 1916, No. 1155 and *R.* May, 1917, No. 513. (*Ed.*)

17), *Pulv. polygonata*, Cockerell, at Luzon (Manila), on a cultivated tree;

18) *Pulv. thespesiae*, Green, at Luzon (Laguna, Los Baños), on *Codiaeum variegatum*;

19) *Pulv. psidii*, Maskell, at Luzon (Laguna, Los Baños), on *Antidesma bunius*, *Eugenia Jambos*, *Ficus* and *Psidium Guajava*;

20) *Pulv. psidii philippina*, Cockerell, at Luzon (Tayabas,), Lucena) on *Ficus*;

21) *Ceroplastes gigas*, Cockerell, at Luzon (Laguna, Mount Maquiling) on an unknown tree;

22) *Paralecanium luzonicum*, Cockerell, at Luzon, on *Plectronia viridis* (Laguna, Los Baños); on *Tetrastigma* (Laguna, Mount Maquiling);

23) *Paralec. cocophyllae*, Banks, at Luzon on *Cocos nucifera* (Manila) on *Dillenia philippinensis* (Laguna, Mount Maquiling);

24) *Platylecanium cribrigerum*, Cockerell and Robinson, at Luzon (Laguna, Los Baños) on *Piper Loheri*;

25) *Saissetia oleae* (Bernard), at Luzon (Tayabas, Lucban), on *Gardenia* or *Jasminum*;

26) *S. nigra* (Nietner), at Luzon on *Manihot utilissima* (Manila); on *Eriodendron anfractuosum* and *Witania origanifolia* (Laguna, Los Baños)

27) *S. hemisphaerica* (Targioni Tozzetti), at Luzon, on *Cycas circinalis* and other cultivated plants; on *Anona muricata* and *Calanthe* (Laguna, Los Baños);

28) *Coccus elongatus* (Signoret), at Luzon, on *Codiaeum variegatum* (Tayabas, Lucban); on *Anona squamosa* (Laguna, Los Baños);

29) *C. diversipes*, Cockerell, at Lugon (Tayabas, Lucban), on *Asplenium nidus*;

30) *C. viridis*, Green, at Luzon (Laguna, Los Baños) on *Antidesma Bunius*, *Citrus decumana*, *C. nobilis*, *Gardenia florida* and *Strychnos Nux-vomica*;

31) *Odonaspis schizostachyi* Cockerell and Robinson, at Luzon (Laguna, Los Baños), on *Schizostachyum acutiflorum*; the colonies of this scale are usually completely covered by the fungus *Septobasidium Bakeri*, Patouillard;

32) *Fiorinia fioriniae* (Targioni Tozzetti) at Luzon (Laguna, Los Baños) on *Celtis philippinensis*;

33) *F. phantasma* Cockerell and Robinson, at Luzon (Laguna, Mount Maquiling), on *Machilus*;

34) *Aulacaspis rosae* (Bouché) at Luzon (Tayabas, Lucban), on *Rosa*;

35) *Phenacaspis inday* (Banks), at Luzon, on *Cocos nucifera* (Manila); on *Mangifera indica* (Laguna, Los Baños);

36) *Phenac. eugeniae* (Maskell) at Luzon (Manila), on a palm;

37) *Phenac. mischocarpi*, Cockerell and Robinson, at Luzon (Laguna, Los Baños), on *Mischocarpus fuscescens*;

38) *Phenac. pellucida* sp. nov., at Luzon (Laguna, Los Baños), on *Macaranga Tanarius*;

39) ***Phenac. thoracica*** sp. nov., at Luzon (Laguna, Los Baños), on *Morinda bracteata ;*

40) ***Phenac. pallida*** sp. nov., at Luzon (Laguna, Los Baños), on *Litsea;*

41) ***Chrysomphalus pedroniformis*** Cockerell and Robinson, at Luzon, on *Eriodendron anfractuosum* (Bataan) ; on *Vitis vinifera* (Laguna, Los Baños) ;

42) ***Chrys. aurantii*** (Maskell), at Luzon, on *Artocarpus* (Manila), on *Astronia* (Laguna, Mount Maquiling) ;

43) ***Chrys. aonidum*** (Linnaeus), at Luzon, on *Artocarpus, Cocos nucifera,* and another palm (Manila) ; on a climbing aroid (Laguna, Mount Maquiling); on *Arenga saccharifera, Citrus nobilis, Cocos nucifera* and *Garcinia* (Los Baños) ;

44) ***Chrys. rossi*** (Maskell), at Luzon, on *A. saccharifera* and *Cycas circinnalis* (Tayabas, Lucban), on an orchid quarantined at San Francisco ; This was the first coccid to be recorded from the Philippine Islandsi.

45) ***Schizaspis lobata***, Cockerell and Robinson, at Luzon. (Laguna, Los Baños) on *Ficus nota ;*

46) ***Parlatoria zizyphus*** (Lucas), at Luzon (Laguna, Los Baños), on *Citrus decumana* ; recorded by SASSCER on *Citrus* cuttings from the Philippine Islands ;

47) ***P. proteus*** (Curtis), at Luzon (Manila) on *Eugenia malaccensis* ;

48) ***P. greeni***, Banks, at Luzon (Manila), on *Cocos nucifera* ;

49) ***P. pergandii***, Comstock, at Luzon, (Manila) on an aloe-like plant ; on *Celtis philippinensis* (Laguna, Los Baños) ; .

50) ***Selenaspidus articulatus***, Morgan, found on *Citrus* cuttings, Philippine Islands ;

51) ***Aspidiotus cydoniae***, Comstock, at Luzon (Laguna, Los Baños) on *Blumea balsamifera* and *Hibiscus mutabilis ;*

52) ***A. cydoniae*** var. ***greeni*** Cockerell, at Luzon (Laguna, Los Baños) on *Achras Sapota* and *Chrysanthemum ;*

53) ***A. lataniae***, Signoret, at Luzon (Tayabas, Lucban), on " cabbage " (cabbage palm, *Euterpe oleracea?*) ;

54) ***A. coryphae***, Cockerell and Robinson, at Luzon (Laguna, Los Baños) on *Corypha alata* ;

55) ***A. destructor***, Signoret, at Luzon (Laguna, Los Baños). on *Cocos nucifera, Eugenia calubcob, Mangifera indica, M. verticillata ;*

56) ***A. translucens***, Cockerell, at Luzon on *Anona squamosa, Aleurites moluccana, Carica Papaya, Cocos nucifera, Codiaeum variegatum, Dioscorea alata. Mangifera indica, Musa sapientum, Psidium Araca, Spondias, Tamarindus indica* (Laguna, Los Baños) ; on *Phoenix dactylifera* (Bataan, Lamao) ; on coconut seedling (Tayabas, Lucban) :

57) ***A. tayabanus***, Cockerell, at Luzon (Tayabas, Lucban) on *Gardenia* or *Jasminum* ;

58) ***A. rapax***, Comstock, at Luzon, Manila market on oranges from Southern California ;

59) ***Pseudaonidia obsita***, *Cockerell* and Robinson, at Luzon (Laguna, Los Baños) on *Ficus caudatifolia ;*

60) *Pseudaon. trilobitiformis* (Green), at Luzon (Manila), on *Artocarpus*;

61) *Pseudaon. circuliginis* (Green), at Luzon (Laguna, Los Baños), on *Corypha elata*;

62) *Lepidosaphes rubrovittatus*, Cockerel, at Luzon (Manila), on *Eugenia malaccensis*;

63) *L. lasianthi* (Green), at Luzon (Laguna, Los Baños), on *Codiaeum variegatum*;

64) *L. luzonica* sp. nov., at Luzon (Benguet, Baguio), on *Ficus*;

65) *L. ixorae*, Cockerell and Robinson, at Luzon (Laguna, Los Baños) on *Ixora coccinea*;

66) *L. cocculi* (Green), at Luzon on a palm (Manila); on *Erythropalum scandens* (Laguna, Los Baños);

67) *L. mcgregori*, Banks, at Luzon (Manila), on *Cocos nucifera*;

68) *L. unicolor*, Banks, at Luzon (Manila), on *C. nucifera*;

69) *Hemichionaspis uvariae*, Cockerell and Robinson, at Luzon (Laguna, Los Baños), on *Uvaria* sp.;

70) *H. townsendi*, Cockerell, at Luzon (Tayabas, Lucban), on *Gossypium*;

71) *H. aspidistrae* (Signoret), at Luzon, on *Erythropalum scandens* (Laguna, Los Baños); on *Piper* (Benguet, Baguio);

72) *Pinnaspis siphonodontis*, Cockerell and Robinson, at Luzon (Laguna, Los Baños), on *Celtis philippinensis*, *Sandoricum koetjape* and *Siphonodon celastrines*;

73) *P. buxi* (Bouché) at Luzon (Laguna, Los Baños), on *Homalonema philippinensis*;

There follows a list of the host-plants and the coccids living on them, and finally the writer gives explanations of the scientific terms used in the course of the systematic descriptions of the insects.

1254 – **Disease of Bacterial Origin Observed in *Sparganothis pilleriana*, in France.** — DAUMÉZON, G., in *Bulletin de la Société de Pathologie végétale de France*, Vol IV, No. 1, pp. 8-10. Paris, 1917.

In a vineyard at Aramon (Aude), the tegument of some larvae of *Sparganothis pilleriana* Schiff. which had already reached the last moulting stage, was found to be brownish and soft and the movements of the larvae were weak. When taken to the laboratory they died before the pupal stage was reached.

An examination of the blood of one of these larvae while it was yet alive, showed the presence of numerous slightly ovoid bacteria, about 1.5μ in diameter. The diameter increased somewhat in later cultures on artificial media, but the bacteria never really had the appearance of rods, and chains of more than four or five microorganisms were never formed.

The bacteria, described biologically in this preliminary note, resemble the microorganisms causing "flacherie" in the silkworm, and various types of pneumococci and enterococci.

2355 - **Observations on *Meigenia floralis*, a Dipterous Parasite of the Lucerne "Negril" (*Colaspidema atra*), in France** (1). — LECAILLON, in *Comptes rendus des séances de l'Académie d'Agriculture de France*, Vol. III, No. 30, pp. 881-885. Paris, 1917.

According to observations made at Bordeaux, Montpellier and Toulouse, in 1914, the larva of the tachinid *Meigenia floralis* Meig., lives as an internal parasite of the larva of the chrysomelid beetle *Colaspidema atra* Latr. and causes its death.

In studying the effectiveness of the parasite, the first question to answer was to determine if *M. floralis* appeared early enough and lived long enough to be able to lay its eggs on the series of *C. atra* larvae that attack lucerne from May 10 to 15 till July 10 to 15. The observations made in 1914, 1916 and 1917, show that *M. floralis* only commences oviposition in the first days of June, but can also oviposit after the time at which the last *Colaspidema* larvae have left the lucerne. Moreover a 2nd generation of *Meigenia* appears before the end of June and can attack the *Colaspidema* larvae, then in abundance. Practically, it may be said that the *Colaspidema* larvae are little, if at all, parasitised at their first appearance, whilst they are parasitised to a considerable proportion at the time when they begin to be rare (the number of parasitised larvae thus varies from 1 to 2 % up to 70 %).

Many *Colaspidema* larvae, especially at the end of June and beginning of July, when the parasite is very plentiful, usually contain more than one *Meigenia* egg (very often 2 or 3, even more and sometimes as many as 12), although the larvae cannot provide food for more than one parasite.

In various regions, the lucerne fields attacked by *Colaspidema* contain larvae parasitised in extremely variable proportions.

It is well known that *M. floralis* parasitises the larvae of the asparagus beetle (*Crioceris asparagi*). In studying, in a locality near Toulouse, the parasitism of *Meigenia* which was attacking *Colaspidema* in a lucerne field on the one hand, and the larvae of *Crioceris asparagi* in an asparagus field on the other, the author found complete uniformity in both cases. PAUTEL'S work on *Meigenia* as a parasite of *Crioceris* can be equally applied to the case of *Colaspidema*. But in the case of *Crioceris*, there is at least a third generation of *Meigenia* which can attack the *Crioceris* larvae, which remain on the asparagus much longer than do the *Colaspidema* larvae on the lucerne. Again, *Crioceris*, in ranging more to the north than *Colaspidema*, is followed and attacked by *Meigenia* up to the Oise and probably further north still. The existence of *M. floralis* may be said to depend more on that of *Cr. asparagi* than that of *Colaspidema*. If *Meigenia* did not attack other insects than *Colaspidema*, its third generation could not develop and the dipteron would disappear. The presence of *Cr. asparagi* is, therefore, essential to the maintenance of the parasite in a given region.

M. *floralis* annually destroys a large number of *Colaspidema*. In spite of this, the latter never becomes so rare as to cause but insignificant damage;

(1) See also *B.*, April 1913, No. 434. (*Ed.*)

as is agreed by the agriculturists of the Haute-Garonne district. It migl be advisable to attempt to increase the destructive capacity of *M. flora* The writer has shown that it is easy to distinguish parasitised larvae *Colaspidema* and *Crioceris*, for they carry the eggs of *Meigenia* fix on their body for some days. The eggs are white and easily seen with t naked eye. Parasitised larvae can be quickly and easily captured, a they are, moreover, usually sufficiently grown so as to have no further ne of nourishment. They could easily be carried in any suitable box. Abo twenty days pass from the time the egg is deposited on the host-larva when the adult *Meigenia* emerges from the dead body of its host. T parasite could, therefore, be easily taken from a locality where it occu in abundance to one where it is uncommon.

It would doubtless be advantageous to grow asparagus in those distric where *C. atra* is harmful, as this plant, being the host-plant of *Criocer* would afford shelter to the last generation of *Meigenia* and allow the par site to pass the winter until the next season.

1256 – **The Ant *Dolichoderus bituberculatus* in the Control of Pests of t Cocoa-tree, in Java** (1). — GOOT, P. VAN DER, in *Mededeelingen van het Proefstatio Midden Java*, No. 25, pp. 1-142. Batavia, 1917.

Ants, especially the three species "gramang" (*Plagiolepis longip* Jord.), "nanggrang" (*Oecophylla smaragdina* Fabr.), and "black" (*Dol choderus bituberculatus* Fabr.), play an important part in extensive cultiva tion in central Java.

Having recently published his studies on the "gramang ant" the au thor now describes the importance of the "black ant" in cocoa-tree planta tions. Towards 1908 certain cocoa growers in Java noticed that, in plan tations infested with "black ants", the damage done by *Helopeltis* was less The introduction of large numbers of these ants into the cocoa-tree plan tations was, therefore, advised, but as, during the following years, *Helopelti* was less active, this advice was hardly followed; flaming the trees attack ed and catching the insect sufficed to keep the pest under.

During the last few years *Helopeltis* again spread, and its attacks be came disastrous. For this reason the author again studied the action o ants on *Helopeltis* and *Acrocercops cramerella* Sn., which gnaws the pods

The "black ant", a species of *Dolichoderus* of which there ar five types in Java, is distinguished, not only by special morphological char acters, but also by the fact that it never seeks shelter under the soil, as do other more or less dark ants found in the plantations. The life cycle o the ant is described in detail.

The "black ant" greedily eats the sweet substance secreted by *Pseudo coccus crotonis* which is found on the pods and young shoots of the cocoa tree. It rarely seeks other food if there is an abundance of these coccidae; it does not remove them, but incessantly enters the colonies and carries away the sugar to its nest, made of the remains of dead leaves.

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(1) See also *R.* Nov., 1916, No. 1249; *R.* May, 1917, No. 507, *R.* June, 1917, No 614; No. 1259 of this *Review*.

By experiments in breeding cages it was possible to determine the part layed by the ant in preventing *Helopeltis* from attacking the fruit or oung stalks. The ant does not attack *Helopeltis* directly, but, by worrying ; prevents it from making a hole in the shell of the pod; its incessant visits xhaust the *Helopeltis*, which finally goes away, leaving the pod intact. Inder a cage, where escape is impossible, *Helopeltis* dies. Worried by the nt, *Helopeltis* hardly finds a moment's respite in which to lay its eggs.

The part played by the " black ant " in the control of *Helopeltis* is losely connected with the presence of *Ps. crotonis*. The author shows the ecessity, not only of transporting the ants into the plantations by removing he nests and offering suitable shelters made with dry leaves or the inter-odes of bamboo, but of also placing the *Pseudococcus* on the trees; this may e done by placing parts of pods infected by the *Pseudococcus* among the ranches of trees which are still immune.

Acrocercops cramerella Sn. is another serious pest of the cocoa-tree. The larvae which hatch from the eggs laid on the shell of the pod, make their vay to the inside, where they soon spoil the seeds. Although the " black nt " does not radically prevent the attacks of *Acrocercops*, it greatly redu-es the damage done by it. The ants follow *Acrocercops*, worrying it conti-nually, but, as this insect lays its eggs while moving over the fruit, some re-nain fixed on the pods. The " black ant " is, therefore, an insufficient neans of controlling *Acrocercops* and for this reason, the gathering of all he fruit, ripe and green is advised.

The presence of ants protects the *Pseudococci* against the attacks of parasitic insects (wasps, etc.) thus allowing them to propagate rapidly.

The morphology and biology of *Ps. crotonis* are described, and its pa-rasites enumerated, among them *Diplosis* sp., a chalcid, *Scymnus* sp. and *Spalgis epius*. *Pseudococcus crotonis* sucks the shell of the pod, so that part of the nutritive substance of the plant goes as food for the coccid instead of being used for the good of the organs of the plant. They, therefore, harm the plant, but to a min'mum extent, and the comb'nat'on of *Ps. crotonis* with the " black ant " is so advantageous for the cocoa-tree in controlling *Helopeltis* and *Acrocercops* that it is advisable to introduce the " black ant " into cocoa plantations wherever *Helopeltis* is active.

1257 - ***Willistonia exuriens*, a Tachinid Parasite of the Lepidopteron *Automeris janus* in the Island of Trinidad, Antilles** (1). — URICH. F. W., in the *Bulletin of the Department of Agriculture, Trinidad and Tobago*, Vol. XVI, Part. 1, pp. 21-22. 1 plate with 1 fig. Port of Spain, 1917.

Sir N. LAMONT reared from pupae of *Automeris janus* a fly which has been determined as *Willistonia exuriens*.

The writer briefly mentions the habits of the *Tachinidae* (the family to which the above-mentioned parasite belongs) and also the systematic char-acters of the latter. Its larvae live in the body of the caterpillar of the moth,

(1) See on this subject No. 1260 of this *Review*.

and the pupae are formed in the pupal covering of their host. From o *Automeris* pupa which measured about 2 inches, 9 individuals of *Wil stonia* issued.

1258. – **Patents for the Control of Diseases and Pests of Plants.** — See No. 1211 this *Review*.

1259 – ***Araeocerus fasciculatus*, a Coleopteron Injurious to *Tephros candida*, in Java.** — GOOT, P. VAN DER, in *Mededeelingen van het Proefstat Midden-Java*, No. 26, pp. 1-36. Batavia, 1917.

Tephrosia candida is of importance among the plants used as gre manure for the various crops in the mountain district of Java, but satisfa tory cultivation of this plant is hindered by a coleopteron which attacks t fruit, so that it is almost impossible to gather a sufficient quantity of sou seeds for sowing. A description of the morphology and biology of this inse is given.

The insect belongs to the *Anthribidae* family and has been identified *Araeocerus fasciculatus* De Geer. The females measure from 4 to 4.5 m limetres, the males from 3.8 to 4.2 millimetres. The female lays its eg in the half ripe, or nearly ripe, pods of *Tephrosia* when the seeds are alrea of a good size. The insect first gnaws a hole through the pod, then passes i ovipositor through the hole so as to lay an egg near a seed.

After 6 or 7 days the young larvae hatch and begin almost immediat to eat the seed; 23 to 29 days later the larvae pupates. The pupal sta lasts about 7 or 8 days, after which the adult insect emerges. About days later the insect gnaws through the wall of the pod and flies away. A ter another 10 days or so the insect may start laying again. Every fema may lay during about 25 days, giving a maximum of 84 eggs.

Since the different stages through which the insect passes require fro 38 to 44 days and laying begins 12 days after, one insect may produce 6 7 generations in a year.

With a production of 30 eggs and a 50 % mortality, the descendan in one year would amount to 260 000 females, since the number of femal produced about equals that of the males. The insect can feed on anythi that is not too hard, it travels easily and a flight of over 1000 yards does n seem impossible for the adults.

In one plantation only 5 % of sound seeds were found; in another, whe *Tephrosia* is specially well tended, 75 % of the seeds were attacked. Oth Leguminoseae have been found to be attacked by *Araeocerus* in the same wa *Crotalaria striata*, *Sova hispida*, *Indigofera* sp. and *Cassia occidentalis* a quoted as host-plants. The wide distribution of these plants makes t control of *Araeocerus* very difficult. The insect is attacked by certai parasites, among them *Aximopsis javensis* Girault, *Eupelmus javae* Girau and two species of Braconidae, but these two parasitic hymenoptera, a though widespread, can hardly check the ravages of *Araeocerus*.

Other means of control are discussed, in the first place treamtent wi 1 ‰ Paris green. As, however, *Tephrosia* continually produces new frui repeated treatment is needed, thus making the method too costly.

In order to control indirectly the *Araeocerus*, the introduction of the ack ant (*Dolichoderus bituberculatus*) together with *Pseudococcus crotonis* to *Tephrosia* plantations is recommended (1). In a plantation in which ese ants were found 64 % of healthy seeds were obtained, whereas ano-er, in which there were no ants, only gave 35 %.

Another method consists in pruning the bushes from time to time. The cle of *Tephrosia* takes 70 days to ripen; the females of *Araeocerus* live, on raverage, 64 days, at the most, 81. By cutting *Tephrosia* in such a way that uctification is prevented during 140 days, the females of *Araeocerus* will unable to lay their eggs in the *Tephrosia* and will die. After the second uning the plant may be allowed to fructify and a practically immune op will be obtained.

– *Automeris janus*, a Lepidopteron Living on Cacao and on *Erythrina* spp, in the Island of Trinidad, Antilles. – LAMONT, NORMAN, in *Bulletin of the Department* [illegible] *Trinidad and Tobago*, Vol. XVI, Part 2, pp. 21, fig. 1–3 of the plate. Port of Spain, 1917.

Automeris janus is one of the largest and most beautiful lepidoptera f Trinidad; it is found commonly in the month of February on *Erythrina* mmorto[illegible], and cacao trees. In confinement it eats the leaves of either ao or the coral tree (*Erythrina umbrosa* and *E. velutina*), but seems to efer those of the cacao. In the natural state, however, it is found more equently on the coral tree. The probable reason of this is that the rough rk of *Erythrina* suits the larva better than the smoother bark of the cacao spinning its cocoon upon.

Owing to the size of the insect, its wide distribution, and its method f living on both cacao and immature it would cause much more damage the island, were it not for the fact that it is kept in check by a parasite. 24 *Automeris* larvae reared by the writer, only one succeeded in com-leting its transformation into the perfect insect. All the others were acked by a fly and the pupa cases of *A. janus* were packed full of the ses of this fly.

– *Lasioderma serricorne*, a Coleopteron Injurious to Tobacco and other Plant Products, at Deli, Sumatra – [illegible] DE, in *Mededeelingen van het* [illegible] *Proefstation*, Year X, pp. [illegible]

Lasioderma serricorne is an insect found everywhere where tobacco is repared for the market, and also among numerous other plant products. long list is given of the stock of native shops capable of giving this insect efficient food and an environment favourable to its propagation; first f all comes tobacco, then various species of leguminous seeds, those of *Ca-um Carvi* and *Coriandrum sativum*, maize, rice and flour.

The life of the insect, which is dependent on the temperature and the od, lasts, at Deli (Sumatra), from 6 to 9 weeks. The number of genera-

(1) On this subject see No. 1250 of this Review.

(2) See also *B.*, Nov., 1914, No. 1081; *B.* May, 1916, No. 501; *B.* June, 1916, No. 711. (*Ed.*)

tions also varies a great deal with the conditions under which the female lives.

Strong measures have had to be taken at Deli to suppress this pest. The holes which the insect bores in the tobacco leaves greatly decrease their value. Fortunately carbon bisulphide has been found to be a satisfactory means of disinfection.

The methods of applying carbon bisulphide are described in length. Preference is given to the use of an hermatically closed room in which are placed the balls of tobacco and dishes containing carbon bisulphide; contact must be carefully avoided; 300 cc. of carbon bisulphide are sufficient to disinfect 1 cubic metre (35.316 cubic feet). The tobacco is left 1 or 2 days in the disinfecting room and then subjected to aeration in a place where new infection is impossible. As soon as all traces of carbon bisulphide have disappeared, the tobacco, which has undergone no change in taste or colour, may be sent away.

Radical disinfection of the fermentation sheds is essential. An inspection of all goods which may shelter the insect in the neighbourhood of the sheds is necessary to check the pest and prevent its spread.

1262 – ***Tarsonemus pallidus*, a Mite Injurious to Geraniums and Other Plants in Maryland, U. S. A.** (1). – GARMAN, P., in *The Maryland Agricultural Experiment Station, Bulletin* No. 208, pp. 337-342, fig. 1-13. College Park, Md., 1917.

Tarsonemus pallidus Banks not only causes great damage to cyclamen and snapdragons in Maryland, but also attacks chrysanthemums, fuchsias and geraniums. It appears to have been recorded first on geraniums in 1914 near Baltimore. It should be noted that the female of a species of *Tarsonemus* identical with *pallidus* has been found on linden trees at Maryland State College.

Because of the great injury caused by this mite to other plants, the Author offers the term *pallid mite* in place of the usual term *cyclamen mite* — on account of its brevity, descriptive power and wider application than the latter name.

Injury to geraniums by the parasite is sometimes severe. If the mites are numerous, the attack causes the leaves to curl, spot and die prematurely. The injury may be recognised before the mites are observed by the appearance of scorched spots on the underside of the leaves. Mites are usually present, however, before the injury becomes apparent. Plants heavily infested have been known to lose all their leaves, the leaves being frequently invaded by fungi before falling from the stem. The injury to heavy wooded varieties is less pronounced, but the mites usually cause the scorched appearance previously mentioned. Injury is most severe when the plants are crowded, the leaves in contact and the humidity high. If the plants are well spaced, the injury is seldom serious and the mites disappear or are greatly reduced in numbers in a short time.

(1) See also *R.*, October 1917, No. 983.

Most varieties of geraniums are attacked by *Tarsonemus pallidus* but a few seem to be resistant. The following varieties have been observed to become infested, or have been infested by artifical means: Le Pilote, Jean Vaud, S. A. Nutt, Alphonse Richard, Madam Kowalevski, Baron Grubisich, Maryland, Beauté Poitevine, Mme. Landry and others. Infestation of La Favorite, a white variety, was obtained with difficulty, although the plants were kept in contact with other varieties that were heavily infested.

Deformation and curling of the leaves as a result of mite injury is much greater in the case of cyclamen and snapdragon plants than geranium. Cyclamen flowers are also attacked frequently, the flowers withering and curling in much the same manner as the leaves.

After having described the life history and habits of the mite, the writer considers various measures for controlling the pest.

Bordeaux mixture may be safely used on geraniums and will doubtless kill the pallid mite. Discolouration of the foliage results as with lime-sulphur, thus rendering the preparation of doubtful importance to growers. Various of the insecticides experimented with were found to injure the leaves and were therefore discarded. Injury due to treatment with chromic and picric acid is slow is appearing and it is possible that a thorough watering of the plants on the day following treatment will reduce injury to a negligible factor. Small tests with nicotine extract (" Black-leaf 40 ") seem unfavourable on the whole, but it is probable that nicotine has some repellent action and should prove valuable as a preventative. A stream of pure water will dislodge *Tarsonemus* more readily than red-spider (*Tetranychus telarius*) because of the fact that the former spins no web. With geraniums, this method of control is available because the leaves do not curl sufficiently to hide the insect as is the case with snapdragons, and frequent syringing from below will, it is thought, prove effective. For isolated plants or small beds, is recommended that they be well spaced so that no migration may take place from plant to plant and that as much light and air be provided as possible. Under these conditions no trouble should be experienced from injury by the pallid mite.

INJURIOUS VERTEBRATES.

1263 - ***Agelaius icterocephalus*, a Bird Injurious to Rice in the Island of Trinidad (Antilles).** — F. W. URICH in *Bulletin of the Department of Agriculture, Trinidad and Tobago*, Vol. XVI, Part. I, p. 21. Port of Spain, 1917.

It appears from observations in the rice fields in the district of Chaguache, that the yellow headed Caciques (*Agelaius icterocephalus*) swoop down in flocks of as many as 200 as soon as the rice seed is sown for making nurseries and pick up the grain. Until about 10 or 14 days after sowing, the nursery is not safe from these birds, for they readily pull up the recently rooted seedlings which they leave to wither on the ground as soon

as they have detached the seed. After the period just mentioned, the small plants have usually become too strong to be easily pulled up, and are not interfered with any more.

After giving LEOTAUD's description of *A. icteroccphalus* and describing the habits of the latter, the writer draws attention to the fact that this bird is insectivorous, and therefore useful in spite of the injury it does to the rice nurseries. It should therefore not be killed, and as it is destructive to rice for only the first fortnight after sowing, the best plan would be to protect the nurseries, which are not as a rule very extensive, by means of covers of wire netting, or any cheap light cloth.

ALFREDO RUGGERI, *gerente reponsabile.*